Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT.

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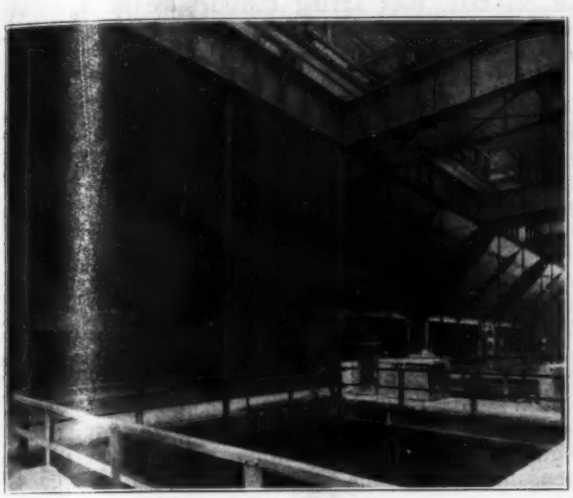
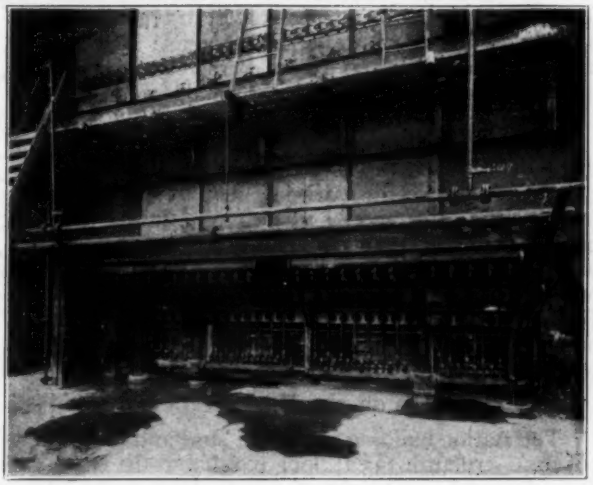


View of Boiler Room Aisle, Showing 14-Retort Underfeed Stokers in Progress of Installation.



Gas Burners Installed in Rear of Wall of Boiler Setting for Using Surplus Natural Gas in Summer.

Cincinnati's New 100,000-Kilowatt Power Station

Being First Installment Describing Station Layout and Mechanical Equipment of Union Gas & Electric Company's New Station With Initial Capacity of 50,000 Kilowatts

THE NEW power plant of the Union Gas & Electric Company, Cincinnati, already mentioned in past issues of the ELECTRICAL REVIEW, has been in service now for several weeks. The new plant is situated on the north bank of the Ohio River, about one-half mile northwest of the business center of Cincinnati and close to the tracks of several railroads. The station grounds comprise about 10½ acres between the river and Front Street and directly opposite this street is the new artificial-gas works of the company as well as the terminal substation of the high-pressure natural-gas mains from the West Virginia gas fields. The site is, therefore, ideally located for a large, economical and efficient power plant combining abundant and economical supplies of condensing water and gaseous and solid fuel. Coal can be delivered by rail or water and stored in considerable quantities on the station grounds. During the summer it is expected to use as fuel the surplus natural gas not needed for distribution in the city for all or part of the boilers.

There is a difference of 70 ft. between extreme low-water and high-water stages on the Ohio River where the new station is located. To secure economy in pumping the condenser circulating water, the condensers have been located near low-water level to permit low lift during times of drought. On the other hand, precautions against high water have had to be taken, the station site having been submerged by as much as 8 ft. at various times.

These considerations resulted in locating all the usual boiler and turbine-room equipment, except condensing apparatus, well above the highest known flood stage, which is 501 ft. above sea-level; the boiler-room basement is at elevation 504, while the main turbine and boiler-room floors are at elevation 522 ft. On account of the closeness of the river, the nature of the soil and the great depth at which the water tunnels and condensers are located, the work on the foundations and related substructure constituted an unusually large part of the plant construction. At the north side of the building the foundations extend down about 65 ft. below ground level, nearer the river they are deeper, and for the intake and condenser wells they reach nearly 100 ft. below ground. The foundations, for the most part, are of reinforced concrete. The condenser wells extend down 84 ft. below the turbine-

room floor. The intake and discharge tunnels lie below low-water level and extend 163 ft. from out in the river to the screen and intake basin or well. The intake tunnel is 10 ft. wide by 25 ft. high and the discharge tunnel is 10 by 10 ft. and adjoins the larger tunnel. All the tunnel walls are of concrete. The intake tunnel leads to the screen basin in which is located a triple-screen equipment for keeping trash and ice carried down by the river from clogging and befouling the condensing apparatus during flood times. A set of stationary bar-iron grills are first installed; second, a group of four Link-Belt traveling screens and finally a set of stationary screens. This intake and screen basin is 60 ft. in diameter and 86 ft. in depth; its walls are of reinforced concrete, 6 ft. in thickness, up to the turbine-room floor.

From this basin there is a 54-in. concrete duct to the suction of each condenser circulating pump. The condensers are set in pairs in condenser pits or wells 68 ft. in diameter and 84 ft. deep, one in the east and one in the west end of the turbine room; these pits have reinforced-concrete walls 8 ft. thick to the floor of the turbine room, the walls forming part of the foundations for the big turbo units. All of the work on the foundations, tunnels, basins and pits was done by the Foundation Company of America.

Features of the Superstructure.

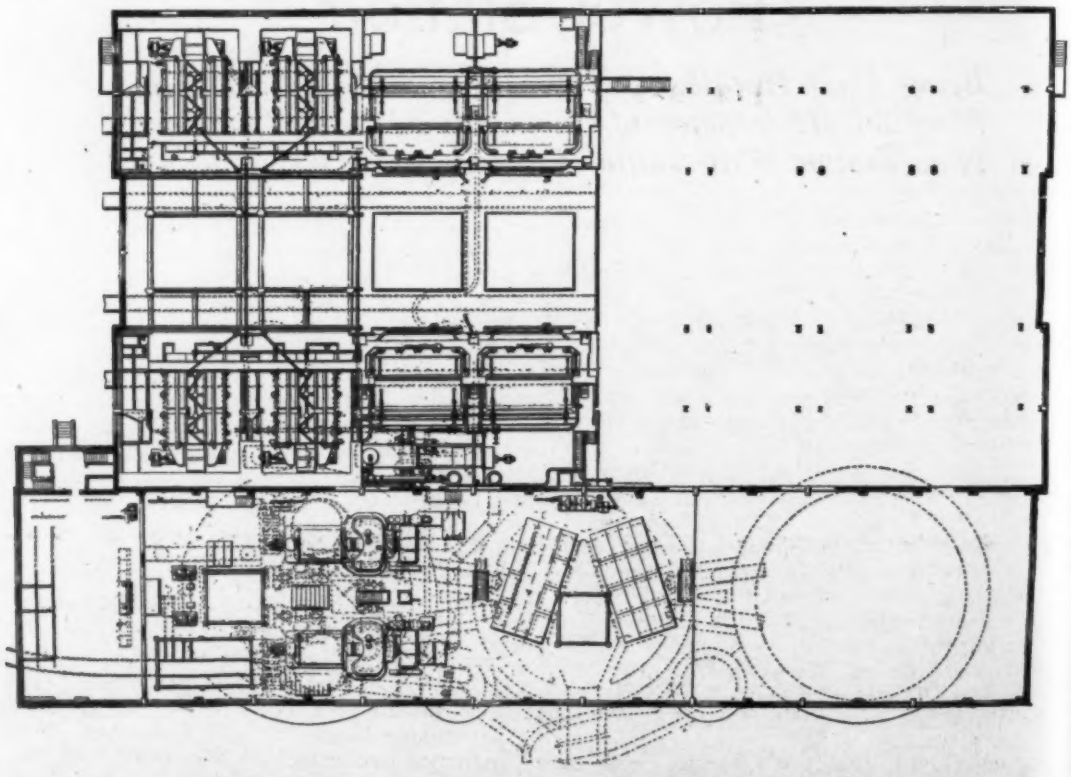
The station building is a brick, steel and reinforced-concrete structure 333 ft. long parallel to the river, 222 ft. wide and has a height of 100 ft. from ground level to the coping. The steelwork forms the main supporting framework of the building and also serves to carry the two steel stacks which extend about 75 ft. above the boiler-room roof. The American Bridge Company was contractor for the steelwork.

All the exterior walls of the building are of red pressed brick, the outline forming a very pleasing architectural effect appropriate to the conspicuous location of the station high on the river bank. The brick exterior is backed with reinforced concrete, an interesting method of bonding the two being used. Each sixth course of brick consists of headers. The brick wall is carried up through the height of two headers. The form on the inside was brought to the same level, reinforcement inserted and the concrete then poured in place. This construction permitted the brick wall to act as the outer form for the concrete, thus saving considerable expense; an excellent bond was also thereby secured between brick and concrete.

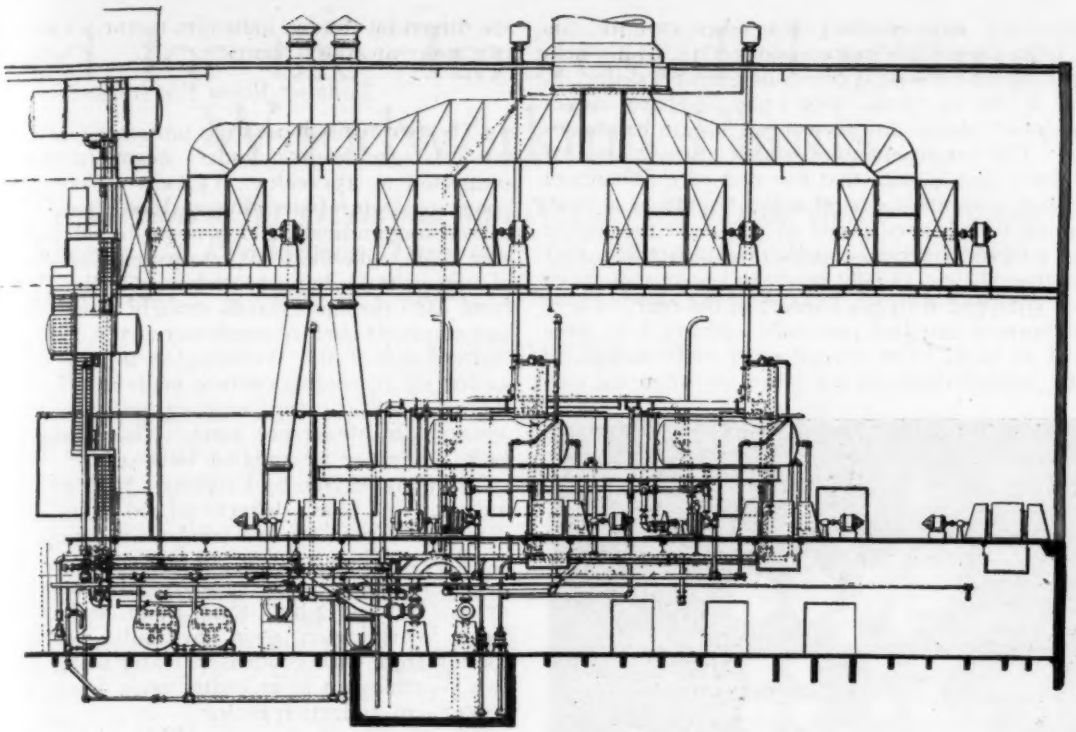
The building as now constructed, is large enough to house four generating units, each of 25,000 kw. capacity. At present two of these are installed. After all four units have been installed in the present building, it is planned to extend it eastward to provide for two additional units, making the ultimate capacity of the station at least 150,000 kw. The turbine room is on the river side of the building and the boiler room on the Front Street side, the length of each, at present, being 300 ft., and the width 68 and 150 ft., respectively. The location of the switch house over the turbine room is unusual in modern power plants, but gives the entire station a uniform height and reduces the ground area of the building. It also served to reduce the volume of the foundations compared to what would have been required by the usual position of the switch house alongside the turbine room—an important saving in this case on account of the costly nature of the foundations.

Coal and Ash Handling.

Coal may be received either by rail or water. Railroad cars deliver the coal either direct into the boiler room or to a large outdoor storage yard between the building and Front Street, capable of storing about



Plan of Station, Showing Initial Installation of Two 25,000-kw. Turbogenerators.



Longitudinal Cross Section of Boiler Room.

35,000 tons. An electric gantry crane with 174-ft. span and grab bucket is provided in this yard for unloading the cars to the storage pile or reclaiming from storage to automatic dump cars that carry the coal into the boiler room. Coal brought by river is hoisted mechanically from the barges and delivered either to the storage yard or direct into the boiler room.

A coal pit runs the full length of the station below the middle of the boiler-room basement floor. It has sloping side walls and cross or sectionalizing walls, both of concrete. Its capacity is 7500 tons and it serves both as a receiving and indoor storage pit. Over each side of the pit, just inside the edge, is carried a standard-gauge railroad track supported by concrete-incased I-beams that span the cross walls of the pit. Trains of bottom-dump railroad cars or the company's own automatic dump cars are run over the pit on these tracks and the coal quickly dumped into the pit. The sloping sides cause the coal to roll toward the center of the pit with minimum breakage.

The central aisle of the boiler room has a series of large protected openings through the floor that give access to the coal pit below. Spanning this aisle just below the roof is an electric traveling coal crane with a three-cubic-yard grab bucket, which, like the bucket for the yard gantry crane, was furnished by Orton & Steinbrenner, Chicago. This bucket picks up and weighs the coal and hoists it into any of the steel hoppers in front of the boilers. Each hopper holds one day's supply of coal for the boiler it serves. This system of coal handling for the boiler room is very simple and economical, and is similar to that in vogue at the Windsor (W. Va.) joint power station of the American Gas & Electric and the West Penn Power companies recently placed in operation. The coal crane and bucket is completely controlled by one operator, who can make one trip a minute with about two tons per trip.

Ash removal is also simple and direct. Below each row of boilers in the basement is another standard-gauge track that runs the entire length of the station and lies directly below the ash pits of the boilers. By merely opening the ash-pit gates the ashes drop directly into railroad cars beneath. All switching of cars in the yard will be done by the company's own electric locomotive.

Boiler-Room Equipment.

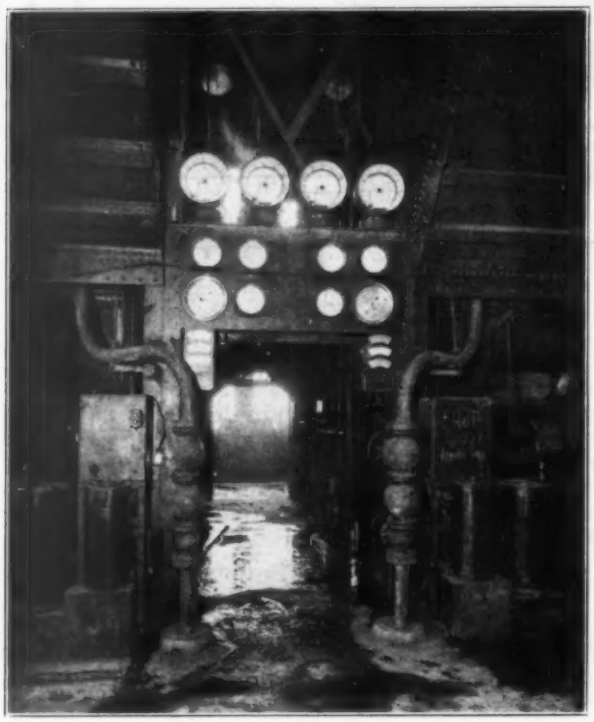
On either side of the central firing and coal-handling aisle of the boiler room is a row of boilers. Four boilers constitute the battery for a turbo unit; three of these suffice; the fourth is a reserve or emergency boiler.

The boilers are Babcock & Wilcox cross-drum water-tube units designed for 250 lbs. per sq. in. steam pressure and 250 deg. F. superheat and a nominal hourly evaporation of 100,000 lbs. of water. Each boiler, rated at 1265 b.h.p., has an effective heating surface of 12,625 sq. ft., exclusive of superheater heating surface. Each boiler is set independently with liberal space on all sides. The initial installation consists of eight boilers, four on each side of the firing aisle. A steel-incased boiler setting is employed with extremely heavy heat-insulating lining, composed of firebrick, Sil-O-Cel, asbestos and brick.

A Sturtevant economizer having 8760 sq. ft. of heating surface, and designed for 325 lb. working pressure, is installed above each boiler. Each unit contains 576 4-in. dia. tubes 12 ft. long. A by-pass for the flue gases is provided for taking any economizer out of service.

Westinghouse 14-retort underfeed stokers serve each boiler at the front. Each is driven by a variable speed 35-hp. direct-current motor and can handle about 13,000 lbs. of coal per hour per stoker. Forced draft is furnished by a motor-driven Buffalo 50,000 cu. ft. per minute blower to each boiler, driven by 100-hp. induction motor, located beneath the boiler-room floor.

A Sturtevant induced-draft fan takes care of the gases from the individual economizers. These fans have a capacity of 90,000 cu. ft. of gas at 300 deg. F. and are driven by 75-hp., 3600-r.p.m., 3-phase, induction motors. Stoker and blower speeds are hand-controlled. The arrangement of stoker, forced and induced-draft fans is such that one unit of each suffices for a bank of boilers during boiler operation at normal rating with a good grade of coal. At the higher ratings a flexible combination is thus obtainable, that proves also efficient at light loads and poor coal. Each boiler is equipped with gas burners at the rear. There are 72 burners installed per boiler, arranged in three rows of 24 each. For exceptionally high ratings, in meeting sudden demands for steam or when the coal



Instrument Panel, Mounted Between Two Boilers, Upon Which the Instruments for Two Boilers Are Mounted.

is of especially low grade, the boilers are heated by both coal and gas.

An instrument board is mounted between each two boilers. Upon these are mounted the instruments for each of the two boilers. These instruments, which are shown for two units in the accompanying illustration, comprise two steam-flow meters, one for each steam line; three double-pen recording thermometers for recording steam temperature of both steam lines, feed-water temperature at entrance to economizer and boiler, and temperature of flue gas at boiler uptake and at economizer exit. Each boiler is also seen to be equipped with a three-in-one draft gauge for indicating pressure over the fire, at boiler uptake and economizer outlet, as well as a steam pressure gauge. Water columns are being installed for indicating wind-box pressures. Indicating watt-hour meters are also going in, for indicating load on the generators.

There are four Worthington 3-stage, 6-in. boiler-feed pumps, each having a capacity of 750 g.p.m. Three of these are driven by 300-hp. turbines, the fourth by a 300-hp. induction motor. Two service pumps, each a Worthington 2-stage, 6-in. centrifugal, are driven by 100-hp. induction motor. There are also two make-up water pumps.

Turbine-Room Equipment.

The two main generating units are Curtis horizontal 17-stage, single-cylinder steam turbines direct-connected to 25,000-kw., 13,200-volt, 60-cycle, three-phase generators operating at 1800 r.p.m. The units extend longitudinally along opposite sides of the turbine room with the low-pressure ends of the turbines of two units bridging a condenser well. The exhaust from each turbine extends straight down some 70 ft. and enters its surface condenser at the side. The condensers are of the Worthington 2-pass type, having 52,000 sq. ft. cooling surface made up of 1-in. diameter tubes 18 ft. long, with capacity for condensing 330,000 lbs. steam per hour. Circulating water for each condenser is supplied by a 42-in. Worthington volute pump driven by a 640-hp., 350 r.p.m. induction motor. This pump delivers 56,000 g.p.m. Each condenser is served by two condensate pumps, one as a stand-by. These pumps are 2-stage, 6-in. Worthington centrifugals with capacity of 1200 g.p.m. and driven by a 153-hp., 1800 r.p.m. induction motor. Four Worthington 10-in. hydraulic nozzles remove the air from each condenser, water being supplied by two Worthington 10-in. centrifugals driven by 185-hp., 1800 r.p.m. induction motor.

A 110-ton four-motor Whiting traveling crane with 15-hp. hoisting motor spans the turbine room. It serves for lifting the heavy traveling and stationary intake screens for special cleaning or repairs (which was one of the reasons for locating the intake well in the turbine room) as well as for general handling of machinery during future plant extensions.

CITY OF SEATTLE PURCHASES LINES OF TRACTION COMPANY.

The entire electric street-railway property of the Puget Sound Traction, Light & Power Company within the limits of the city of Seattle has been sold to the municipality at $15,000,000, payment to be made in public utility bonds, bearing 5 per cent interest, and running 20 years, and secured by a lien on the property conveyed, which embraces 200 miles of trackage and overhead trolley system, 500 street cars, eight car barns, one of which includes an office building, and much freight-handling and other railway equipment. The purchase carries with it an agreement under which the city shall purchase power to operate these lines from the Puget Sound company at 1 cent per kilowatt-hour, estimated to amount to $800,000 per annum.

The purchase has a direct bearing on the city's projected hydroelectric plant on Skagit River, 100 miles from Seattle, for which bonds amounting to $5,500,000 have been voted and approved by the Federal Bond Issues Committee. Preliminary work, in the matter of surveys, borings at dam-site and road construction in connection with this power project is in progress under direction of the city engineer. The city contemplates operation of its street-railway lines eventually with its own electric power.

Seattle is already operating a considerable mileage of municipal street-railway lines, and it is proposed to negotiate for the purchase or lease of the Seattle & Rainier Valley lines within the city limits, and provide for bringing all lines under a unified system, to be under control of the Department of Public Utilities.

Need for the Improved Lighting of Woodworking Plants

Preparedness for Overtime and Nightwork—How Better Lighting Speeds Up Production, Improves Quality and Reduces Accidents—Low Cost—Common Faults—Some Suggestions for Betterment

By F. H. BERNHARD

This is the sixth of a series of twelve articles on improvement of lighting in as many industries. These articles emphasize the desirability of improving industrial lighting to meet present abnormal demands and those to come after the war. The advantages of better lighting are presented in a non-technical way so they may readily be brought to the attention of factory owners, managers and superintendents, very many of whom still have only an imperfect realization of the importance of good lighting to their industries.

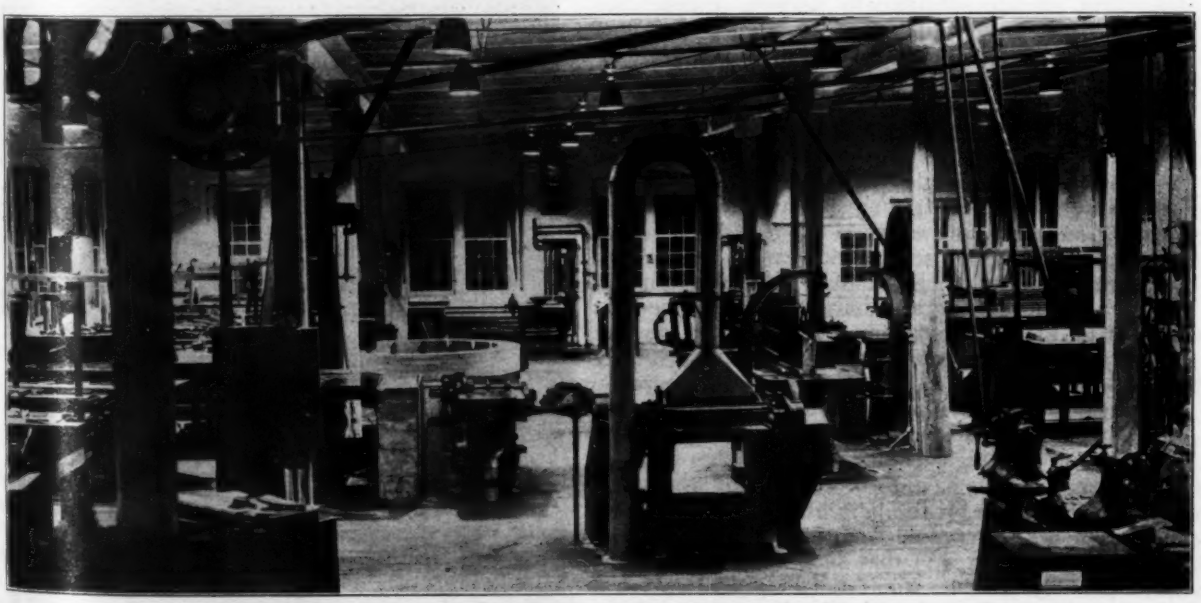
SPEED and accuracy in doing any work without accident or waste is practically impossible where there is inability to see the work easily. Unless the worker is blind, this means that light enough to see without eye strain is essential for highest efficiency in workmanship. The number of workers, who, like the blind, have specially developed another sense so as to make it unnecessary to see the work being done, is extremely small, so that there are but very few exceptions to the general truth of the statement that ample and suitable light is one of the prime requisites for industrial efficiency.

This truth applies to all industries and is gradually being recognized, especially in the newer and larger plants of progressive manufacturers, who are providing the best possible natural and artificial lighting conditions in order that their employes may not be handicapped by poor light with its slowing up of production, lowering of the quality of the product and other attendant evils. In the general run of factories, however, the importance of good light has not yet been recognized, this being particularly true in the smaller and older plants; even in the case of fairly modern factory buildings daylight conditions are commonly allowed to deteriorate and the artificial lighting equipment is largely obsolete and therefore inefficient.

In this respect the woodworking industry is no exception. In some of its many branches considerable attention has been given to improved utilization of daylight, but the equally important provision of good artificial light is frequently sadly neglected. This article attempts to show that good artificial light is not only as necessary as good daylight, but is an investment in plant equipment that brings excellent returns.

Overtime and Nightwork Made Possible by Good Lighting.

The woodworking industry is a very extended one, both as to its distribution in various parts of the country and the variety of products it turns out. The character of the factories is likewise varied, ranging from rough saw mills, through planing mills, sash and door plants, cooperage and box factories,



Woodworking Department of a Machine Works, Showing Excellent General Illumination from High Hung Mazda Lamps with Mirrored Glass Reflectors. All Machines and Spaces Around Them Are Well Lighted Without Drop Lamps.

wagon and carriage works, furniture factories and cabinet works to the highly specialized woodworking departments of piano factories. It is evident that a corresponding wide range exists in the general conditions and refinement of work of these various groups of factories which are mentioned only as some of the principal branches of this diversified industry. In general, it may be said that as the work becomes more and more refined there is more of a tendency to work almost exclusively by daylight. This is a sort of recognition of the importance of good lighting and at the same time an acknowledgment that the artificial lighting available has been relatively poor, at any rate inferior to daylight. With the old lighting equipment used up to a few years ago this was undoubtedly true, but it is no longer true of the much more efficient and effective equipment now available.

Most everyone prefers to work by day than by night, but one of the chief reasons for this preference is that until recently nightwork has involved poor lighting conditions. A poorly lighted workroom is a cheerless place to be in at night, much less to work in with the continual eye strain due to the poor light. Manufacturers are beginning to realize, however, that when work is confined to the daylight hours and only one shift of men they are getting only ⅓ to ½ of the return on the plant investment possible by working 24 or 20 hours per day with 3 or 2 shifts instead of 8 to 10 hours, which really means less than 8 effective hours during the short winter days unless there is provision for abundant artificial light so that the men need not stand around idle during the early morning and late afternoon hours. Increasing use of machinery means increasing plant investment and therefore more need to utilize it intensively in order to meet competition with a reasonable margin of profit.

Quite a few woodworking plants are now making Government supplies, largely propellers and struts for airplanes. In order to meet the nation's urgent needs in this line with maximum speed, these manufacturers are finding it expedient to work overtime or even with 2 or 3 shifts. To do this has meant, of course, the installation of up-to-date lighting systems that provide substantially as good illumination by night as by day. Under such conditions it is found that nightwork can be carried on with as high efficiency as daywork. By such intensive operation the output can be increased greatly, as high as doubled or tripled, without the expensive enlargements of the plant that would be required if similar output were to be obtained by a single shift employed by day only. Evidently, a first-class lighting system enables a manufacturer at minimum expense to provide for rush orders or temporary special work by overtime, or even to permanently double his output by double-shift nightwork, and all this at additional profit because that portion of the cost represented by the fixed charges on the investment per unit of output is not appreciably increased.

Such a lighting system, in order to achieve this result, would have to permit turning out a quality of product fully as high as that produced by daylight. Moreover, it would have to be turned out with undiminished efficiency on the part of the workmen, else the output per man would decrease. Some years ago it would have been said that such a lighting system, while possibly feasible, would not be practical. Great advances have taken place in the lighting art, however, and now it is entirely practical to reproduce daylight production conditions and do it efficiently and at relatively low cost.

The following examples from industries that involve much more exacting visual work illustrate this. In the textile industry formerly summer-made cotton goods produced under daylight exclusively always commanded a higher price because of higher quality than winter-made goods produced partly under daylight and partly under artificial light. The artificial light has now been so improved that goods made in summer or winter or exclusively by nightwork command the same price because they are all of equal quality in well lighted mills. In the automobile industry, the finishing of car bodies, which corresponds closely to the finishing of carriage bodies, was formerly very troublesome because of the changeable character of daylight. In several plants this is now done exclusively under artificial light because it is substantially constant in intensity and direction and in these respects superior to daylight. The same thing is found in any industry, including woodworking in general, the artificial light by night being much more

Fine Cabinet Assembly in an Eastern Furniture Factory. Work Benches and Assembling Spaces Very Well Lighted Without Drop Cords. Note Uniformity of Illumination, Which Is Even Better Distributed Than Daylight.

constant and this advantage largely offsetting the better diffusion usually obtained by day. Its low cost will be referred to later on.

Daylight Must Frequently Be Supplemented by Artificial Light.

Even when the working hours are confined to 8 hours of daylight, the changes in the latter are not only annoying but frequently so serious as to practically stop production. If there is no provision or only very meager provision for artificial lighting, every cloudy day represents a serious falling off in production and usually also an accompanying increase in "seconds" and absolute spoilage. Every sudden storm means an almost complete shutdown of work until the dark clouds have passed by. This retardation or cessation of work is due not only directly to the darkness making it very difficult to see properly, but also to the dismal aspect of a gloomy workroom and its depressing influence psychologically. In any case it represents a heavy loss from wasted time of employes, idleness of machinery, and waste of material that has been damaged or completely spoiled. In comparison a good system of artificial lighting will be very moderate in first cost and very low in operating and maintenance costs.

It should not be inferred from the foregoing that use of daylight is decried. On the contrary, daylight should be utilized to the utmost. Efficiency demands this at all times and especially during present war times when inefficiency and waste are akin to lack of patriotism. Large windows should be provided and they should be kept *clean* to let the daylight in as freely as possible; in large top-floor rooms saw-tooth roofs should be built to give as perfect a distribution of the daylight throughout the room as possible. But to depend on daylight exclusively, with its fluctuations corresponding to the vagaries of the weather and time of day, is about as foolish as to refuse to go to work on a rainy day. Modern industrial conditions require a much more constant production than is possible when variable daylight is depended on alone.

Even when the factory is located in the country, far from the usual city clouds of dust and smoke, provision must be made for reinforcing daylight on rainy or cloudy days, and at the beginning and close of the short winter days. In the large industrial centers, of course, the provision of supplementary artificial lighting is more important only because the more cloudy and smoky conditions call for greater use of the artificial light. Even at noon on a bright, sunny day the middle parts of large rooms are frequently quite dark compared with the very bright areas near the windows; this is especially true where stock is piled high in the middle of the room, thus leaving poorly lighted aisles and affording ready pitfalls for accidents.

Bench Work in a Furniture Factory. General Lighting That Permits Efficient Overtime or Night Work.

General Illumination of a Planer Which Would Obviously Be a Much More Hazardous Machine If the More Customary Drop Lamp Were Used.

Increase in Speed of Production Results from Improved Lighting.

At the beginning of this article it was shown that ample and suitable light is an essential to industrial efficiency. It is not generally realized, however, to what an extent this is true. It has already been stated that efficiency falls off markedly on cloudy days. This is true, however, at all times when either the natural or artificial light is too meager to enable a workman to see properly. It should be obvious that a workman needs to exercise more care and necessarily must work slowly around a saw or planer that is poorly lighted, else he may be the victim of a serious accident. Even the workman that is employed in fitting at a bench must also slow up his work whenever subjected to eye strain due to improper lighting. The time losses thus involved amount to an unexpectedly large total, not uncommonly an hour or more per day that can be easily saved by improving the lighting, both natural and artificial. Such improved lighting should make it easy to look quickly from the machine to the piles of unfinished and finished material without pausing to readjust the eye to a different light intensity; likewise in benchwork the more uniform illumination should enable the worker to turn without a moment's delay from the bench to the piece of furniture or other object he is fitting.

Aside from these considerable time losses, good lighting promotes more orderly conditions in the workrooms, thus permitting aisles to be kept clear of obstructions and, therefore, walking and trucking facilitated. Supervision by the foreman is also made easier when he can see every part of the room, so that the time losses from "stalling" and outright loafing are practically eliminated; quiet naps in dark corners are not likely when every corner is illuminated.

All told, these various time losses can easily aggregate considerably over an hour a day per workman, most of which is unconsciously lost by the workman. It is due to the elimination of these losses that

Finishing Department in a Chair Factory. Provision of General Lighting Makes Work Independent of Early Darkness or Cloudy Days.

increases in production of 10 to 15 per cent and even higher are obtained by installation of a modern lighting system or remodeling the existing equipment along present-day efficient lines.

Improvement in Quality of Work and Quickened Training of New Employes.

The increased efficiency of work made possible by the better visual conditions resulting from improved lighting shows itself not only by an unconscious speeding up in the work, but also in the improvement of the quality of the product. Very neat and accurate work is impossible where the worker is continually straining his eyes because of poor lighting. Flawless shaping of parts, accurate fitting and neat finishing can be expected only where there is abundant light to see the work properly. Neglect of this means increased seconds and greater waste of material. With increasing costs of lumber it becomes more urgent to eliminate all needless waste and to reduce the now heavy annual loss from spoilage. It must be remembered also that improved quality brings higher prices. Good lighting can aid in this materially.

To a new employe good lighting is even more necessary than to an old and skilled hand, especially as regards quality of work. Even if the task is simple, the new worker must watch each detail carefully or else he will make mistakes and spoil much valuable stock. At no time for a great many years has it been necessary to employ new and untrained hands as much as during the past year and doubtless the coming year will see this condition continue. It is a serious mistake to put such hands to work without giving them the best possible working conditions, which includes satisfactory lighting. Failure to provide this can result only in the excessive spoilage referred to and in needless prolongation of the training period, which can ill be spared when war conditions call for greatest conservation of labor.

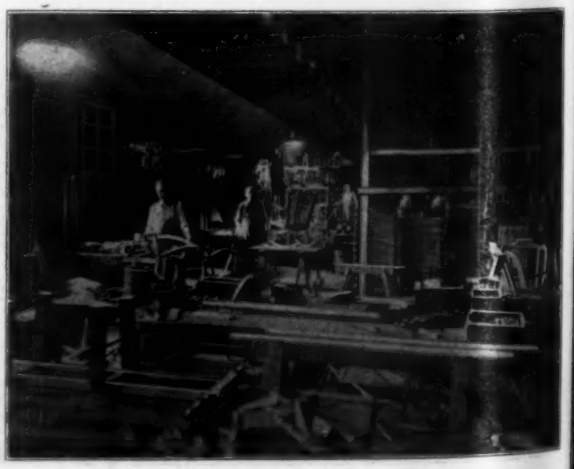
Reduction of Accidents and Other Advantages of Improved Lighting.

Woodworking is an industry that is a prolific source of industrial accidents. Work on saws, planers and other edged tools is necessarily hazardous even when all "safety first" measures are taken in guarding the cutting parts of the machines, as well as belts, pulleys and gears. Machine accidents are usually serious, resulting in the loss of fingers, hands or even arms. But even hand tools cause numerous cuts and bruises. One of the chief causes of accidents is lack of proper light. This is true not only of machinery and tool accidents, but also of accidents from tripping over obstructions in aisles or on stairways.

In an accompanying diagram is shown graphically the distribution of industrial accidents for a typical year as taken from the records of a large liability insurance company. About 91,000 accidents are represented in this curve, which shows that a very large increase in accidents takes place in the winter months when days are short and great reliance must be put on artificial lighting. If this were fully equal to daylight, this winter increase would be very materially diminished. The consensus of opinion among safety experts, inspectors of insurance companies and state industrial commissions, is that about 25 per cent of all industrial accidents could be eliminated by improvement of lighting so as to substantially equal the best daylight conditions. Evidently there is great need for bettering the artificial lighting on this score alone, because the saving that would result per year would run into many million dollars, taking the country as a whole. This saving for one year would alone provide for the installation of improved lighting in nearly every industrial establishment in the country. Aside from this monetary saving is the far more important saving in human suffering, misery and want that results from the annual heavy toll of fatal and serious accidents among our army of industrial workers.

It is with the idea of minimizing this loss in man power and productive capacity to the community that several states have enacted laws empowering their factory inspectors to insist on lighting betterment. The industrial and labor departments of Wisconsin, Pennsylvania and New Jersey have drawn up factory lighting codes which set forth minimum and also desirable requirements as to light intensity for different kinds of work and different portions of typical factories. There is no excuse, however, for a manufacturer to be so shortsighted as to hesitate about improving the lighting of his premises until he is compelled to do so by law, when it is clearly to his interest to take the initiative so as to reap the many benefits of better lighting.

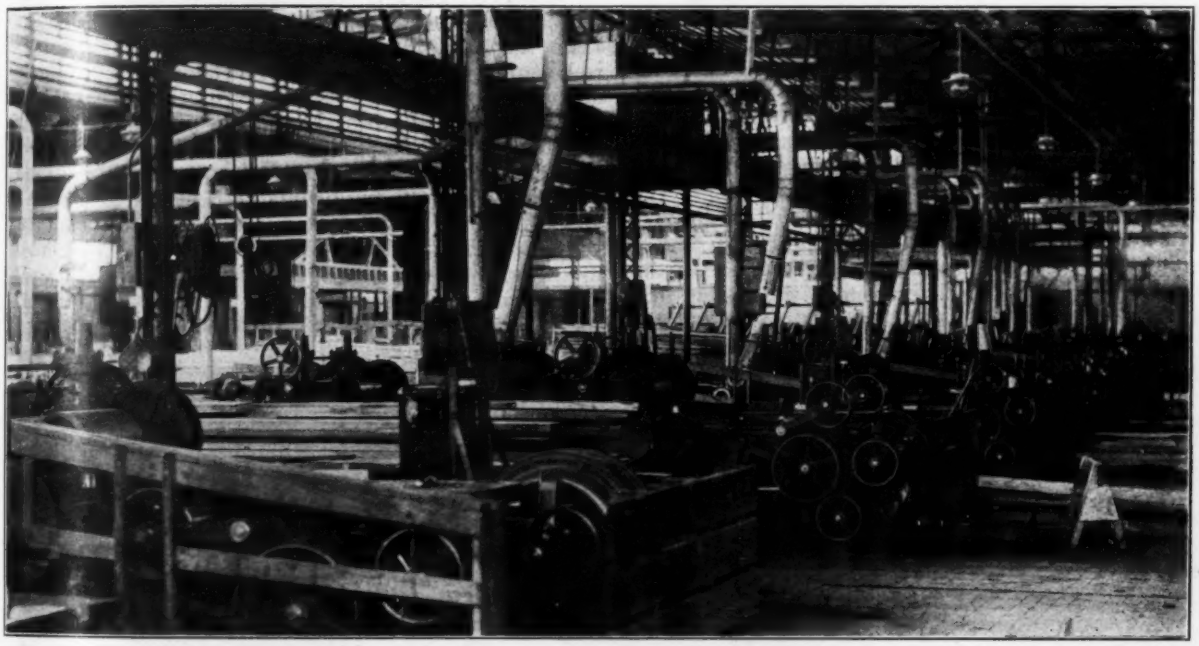
The principal benefits have already been pointed out above. There are several incidental benefits, however, that are also important and of which it is desir-



Fitting and Assembling in a Chair Factory Carried on as Well on Dark Days or by Night as by the Brightest Daylight.

able to speak briefly. One of these is the reduction in eye strain that is brought about by proper lighting. How this influences the speed and quantity of production has already been discussed. It also tends to diminish accidents, because the normal eye is much quicker in perceiving danger than the fatigued eye. Furthermore, it improves the general physical condition of the worker. It is known that continued eye strain is a common cause of headache, lassitude and general bodily fatigue. Removal of the eye strain consequently enhances the alertness and all-around efficiency of the workman.

Another benefit of good lighting is the more cheerful aspect of the workrooms. Gloomy ceilings and dark cavernous portions of rooms have a decided depressing influence which lowers efficiency and breeds discontent. At a time when the labor turnover is abnormally high it is well to do everything possible to promote contentment and guard against discontent. Good lighting helps in this. By reducing accidents, diminishing eye strain and making more cheerful working conditions it actively promotes contentment. An employer who shows real solicitude for the welfare of his employes makes them more contented and develops their good will so that his labor turnover is stabilized and the likelihood of labor troubles is made remote.



Group of Planers in a Large Furniture Factory. Good Daylight from Windows and Skylights. General Artificial Lighting from Cluster Lamps, Which a Few Years Ago Were Good Practice, But Now Are Replaced by Larger Single Units of Higher Efficiency.

Good Lighting is Not Expensive.

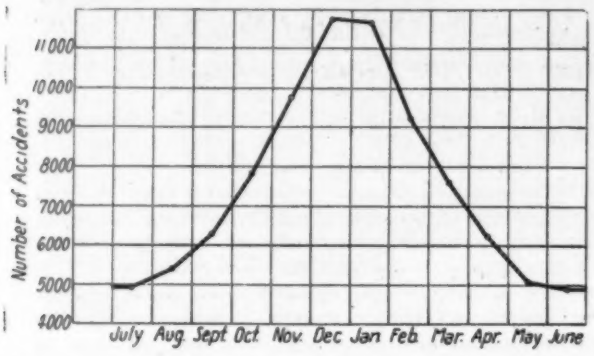
The foregoing review of the numerous advantages of improved factory lighting is not based on theoretical assumptions, but on observed facts that have been verified repeatedly by the experience of progressive manufacturers who saw that better lighting is not an extravagance, but a necessity. Its cost, moreover, has been found very low. To provide an entirely new system of artificial lighting, of course, costs more than merely rehabilitating an existing system. Seldom, however, is it necessary to discard every part of the old system in use, unless it be gas lighting which has no place in a woodworking plant on account of the increased fire hazard. Usually, a careful overhaul of the system enables it to be modernized by re-equipment with the most efficient incandescent lamps and suitable reflectors; moving of some outlets may be necessary, also adding of others. Not infrequently the new system will have actually less outlets than the old.

Operating and maintenance costs with modern, efficient equipment are nearly always low. Whether they will be higher or lower than with the old system depends on a number of conditions, such as the character of the old system and how much increased light was necessary. If the old system had a large number of small lamps of obsolete type, the new system using fewer, larger and much more efficient lamps will probably be cheaper to operate, unless the light formerly was very meager. But even if the operating cost were higher, say twice as high, it will even at that very seldom amount to as much as one per cent of the wages of the employes, this operating cost including energy cost, interest on the investment in the entire lighting system, also depreciation allowance and maintenance cost. In many cases this total operating and upkeep cost is only one-half of one per cent of the labor cost, so that the cost of lighting per employe per day equals only a few minutes of his pay. If the improved lighting enables him to save that number of minutes a day, it has already fully paid for itself, so that any additional time saving and the other incidental advantages it brings are pure "velvet" to the employer.

Poor Lighting Conditions Commonly Found in Woodworking Plants.

Although many of the older plants have apparently no orderly arrangement of either machines or benches, the more modern plants have attempted to utilize daylight most advantageously by placing work benches along the windows and the piles of unfinished and

more or less finished stock toward the middle of the room. In some cases a similar arrangement is also carried out as to the saws, planers, jointers and other machines, although more commonly these are spread more or less over the entire room, especially where



Monthly Distribution of Some 91,000 Industrial Accidents Recorded by a Liability Insurance Company During a Typical Year.

skylights or saw-tooth roofs are used. Working close to the windows has obvious advantages, but the windows should have shades to avoid working in the glaring sunlight. The piles of stock are frequently so high and so promiscuously spread out as to make daylight conditions in the middle of the room very unsatisfactory.

As to artificial lighting, it is exceptional to find a thoroughly first-class installation. In most cases the artificial lighting is an afterthought to prevent the factory from being in utter darkness when daylight fails. Both machines and work benches are usually lighted by drop lamps hanging over and close to the work. Bare lamps are common, or if shades are used they are of the cheap tin or cardboard type. As a rule the visual conditions are very trying from these glaring lamps. Little, if any, general lighting being provided, the rooms are very unevenly lighted and there are bright and many very dark areas. Aisles and passages are frequently treacherously dark. Even around machinery the lighting often increases the hazard because of dark shadows. Inefficient, small lamps, especially carbon and gem type, are found plentifully.

Some Suggestions for Lighting Betterment.

Without radical rearrangement of the plant it is usually possible to provide vastly improved artificial lighting. In the first place general illumination should always be preferred. This consists in placing all lamps close to the ceiling and providing them with suitable reflectors to throw the light down and obliquely over the work. Localized lamps close to the work are practically never needed in woodworking plants. They are a source of endless trouble, serious glare and inefficiency and seldom provide anything more than a spotty illumination. In contrast to this, general illumination can be made quite uniform over the entire floor area or at least over the working portion thereof and somewhat less intense over the stock piles. By arranging the switching the light over these piles may be entirely turned off or alternate units turned off when material is not being piled up or removed, but over the aisles abundant light should always be provided. The provision of general lighting permits shifting work benches and machines without removing and rearranging the lighting units, which is seldom possible where individual localized lighting is employed. Furthermore, it uses fewer and larger lamps that are invariably more efficient than the smaller lamps employed on drop cords.

General lighting, besides giving the more uniform light distribution obtainable from high-hung units, has the further advantage of greatly diminishing glare since the high mounting removes the lamps from the ordinary range of vision. When unshaded or improperly shaded lamps are hung low, their brilliant light striking the eye directly is found very annoying and actually blinding, this action being similar though usually not quite so intense as when looking directly into the sun. However, if long continued, it lowers the efficiency of the worker and gradually injures the eyesight. If a proper reflector is placed over the lamp hung close to the ceiling the direct light from the brilliant lamp filament will usually be cut off unless one looks up at it from almost directly below the unit.

However, glare is troublesome not only from the light of the filament reaching the eye directly, but also from this light reflected to the eye from highly polished surfaces. Consequently, reflection glare is found annoying in machine rooms from the metal working surface or bed of saws and planers or other polished machine areas. Similarly in the finishing room varnished surfaces are commonly also troublesome. For this reason it is desirable in these places to employ special means for diffusing the direct light or otherwise reducing its glare. Ways for doing this include use of bowl-frosted lamps, diffusing cups or rings, and special caps or rings to cut off the direct light from the filament and reflect it back to the main reflecting surface, whence it is finally thrown down to the working area.

In laying out a lighting system, the first thing to do is to study the room and the lighting requirements of the work. Having determined the amount of light needed and its distribution, it is next necessary to select the location and number of the lamps and their size or wattage and a reflector is chosen suitable for the size and spacing of the units and their mounting height. These matters are somewhat interrelated and require considerable skill and judgment based on experience in order to get the best results. Since there are a number of conditions that affect the selection of lamp and reflector size and shape, no simple and generally applicable rule can be given. A few suggestions may not be amiss, however.

Practically the only type of lamp now recommended for woodworking plants is the gas-filled tungsten-filament lamp. These lamps are known as the Mazda C type and are obtainable in sizes from 75 to 1000 watts; the large lamps are never required in plants of this kind. As each shape of reflector has a definite character of light distribution, a certain spacing distance is best suited for any particular mounting height. This evidently affects the number of lamps in many cases. For each size of lamp a particular size of reflector is needed, else the light distribution is not what is expected. Reflectors should be chosen both for efficiency and durability; cheapness usually means sacrificing both. If glass reflectors are selected, mounting at such a height as to make breakage unlikely is imperative. If steel reflectors are used, the reflecting surface should be covered with the best porcelain enamel for ease of cleaning as well as durability and maintained efficiency.

Automatically Remote-Controlled Synchronous-Motor-Generator Substation

Relative Cost of Automatic and Manually-Operated Substation and Mode of Operating Such a Station of 1000-Kilowatts Capacity

By WILLIAM THOMAS SNYDER

Electrical Superintendent, National Tube Company, McKeesport, Pa.

THE ORIGINAL electric power system of the plant referred to here consisted of four 625-kw., 250-volt, direct-current, steam-driven units, the power plant being located near the geographical center of the steel mill. Later there were added two 1000-kw. blast furnace gas-engine units in parallel with the existing units. The next addition was a 3750-kv.a., 80-per cent power-factor, 6600-volt, 3-phase, 25-cycle, low-pressure steam turbogenerator, which power is converted to 250 volts, direct-current, by means of three 1000-kw. motor-generator sets.

One of these motor-generators is located in the turbogenerator station and is in parallel with the direct-current transmission line approximately 2600 ft. east of the main power plant bus. The second motor-generator is located in the main power station and the other is located approximately 2200 ft. west of the main power plant bus and parallel at this point with the direct-current transmission line. This latter motor-generator set is remotely controlled from the main power station; there being no attendants required, the substation being kept locked. The substation is visited once a day by an attendant from the main power station and by the meter reader.

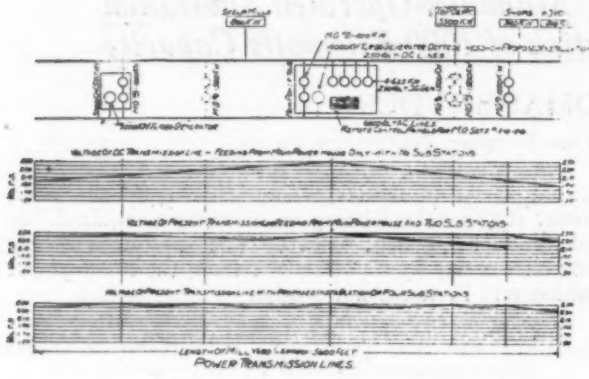
Influence of Station Location on Voltage Regulation.

The improvement in voltage conditions over the transmission system after locating substations at either end of the main transmission line is shown by the accompanying curves.

The dotted lines in the upper diagram show the location of proposed installation of one 1500-kw. motor-generator substation and one 3000-kw. motor-generator substation. These substations will be located at centers of load intermediate between present substations and the main power plant and both will be remotely controlled from main power station.

View of Automatically-Controlled Motor-Generator Substation.

The cost of a remotely controlled substation of the type described is approximately 10 per cent greater than the cost of a manually operated substation. This additional cost is returned each year in the saving effected by eliminating the need of attendants.



Effect of Installation Upon Voltage Regulation.

One of the items in the cost of a remote-controlled substation, which is not present in a manually-operated station, is the control cable between the main station and the substation which is used for switch apparatus, connection to signals, etc. The cost of this item will vary with the distance between the control station and the substation. The control cable between main station and substation is composed of 25 pairs No. 19 B. & S. gauge, copper wire, 600-volt insulation, with lead covering.

Comparative Equipment for Manual and Automatic Substation.

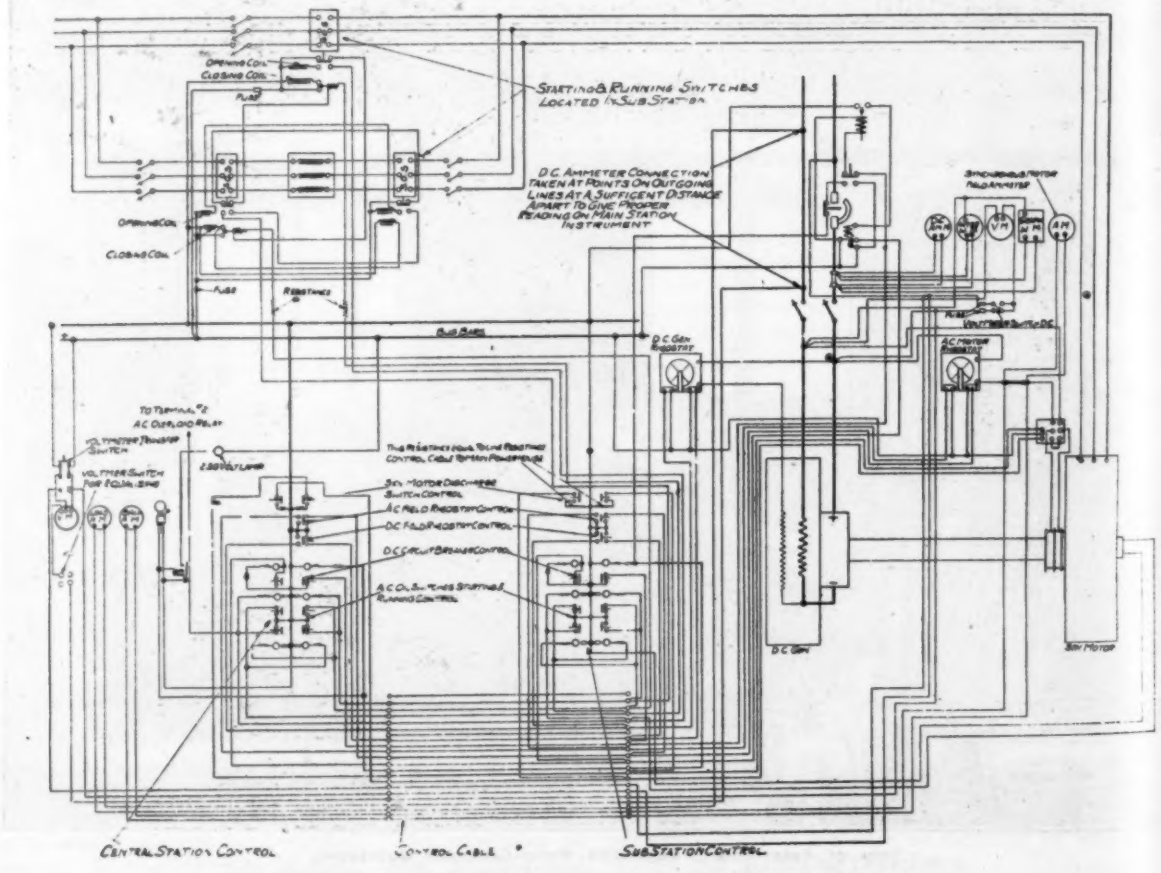
The additional equipment required for each machine for remote controlled substation compared to that required for substation with attendants is given below:

SUBSTATION WITH ATTENDANTS.	REMOTE-CONTROLLED SUBSTATION.
Lever operated oil circuit breakers. (Starting and running.)	Solenoid or motor-operated oil circuit breakers (starting and running).
Lever operated direct-current breakers. (Generator.)	Solenoid or motor operated direct-current circuit breakers. (Generator.)
Not required.	Two control panels. (One in substation and one in main power station.)
Not required.	Lead or steel-covered 600-volt signal cable between main station and substation for starting, stopping and regulating motor-generators.
Hand wheel rheostats.	Solenoid or motor-operated field rheostats. (One for motor and one for generator.)
One direct-current ammeter at substation.	Duplicate indicating direct-current meters. (One at main station and one at substation.)
One paralleling voltmeter at substation.	Duplicate paralleling voltmeter. (One at substation and one at main station.)
Lever type field discharge switch for synchronous motor.	Solenoid-operated field discharge switch for synchronous motor.

Cost of Automatic Substation.

The complete bill of materials for control apparatus for substation described is as follows:

Material.	Required.	Description.
Cable	2250 ft.	2/0, 3-conductor, lead, steel-armored cable.
Joints and end-bells	2	2-straightway, 3-conductor, cable joints and joining material and 3 end-bells.
Cable	100 ft.	2/0 lead-covered cable.
Cable	4 reels	¾-in. messenger wire.
Cable	4 reels	⅝-in. messenger wire.


STARTING & RUNNING SWITCHES LOCATED IN SUB STATION
D.C. AMMETER CONNECTION TAKEN AT POINTS ON OUTGOING LINES AT A SUFFICIENT DISTANCE APART TO GIVE PROPER READING ON MAIN STATION INSTRUMENT
CENTRAL STATION CONTROL
CONTROL CABLE
SUB STATION CONTROL

Wiring Diagram of 1000-kw. Motor-Generator Automatic Substation.

Cable clips	2250	Aerial rings.
Cable	2085 ft.	25 pairs, control cable—lead-covered, paper-insulated.
Cable	875 ft.	2,000,000-c. m. cable.
Cable clips	2250	8-in. long.
Insulators	72	Giant strain.
Switchboard	1	Consisting of two panels—one control panel and one generator panel.
Termials	2	Hard rubber terminals. (For control cables.)
Switches	4	Twin pull-button control switches, with indicating lamps.
Switches	4	Twin pull-button control switches, without lamps.
Switches	4	Pull and push-button control switches.
Rheostat devices	2	Solenoid-operated ratchet device, for operating field rheostats.
Switch	1	D. P. D. T. solenoid-operated discharge rheostat switch.
Switches	12	Disconnecting switches.
Oil switches	3	Single-phase, 15,000 volts, 300 amperes, S. P. S. T.
Oil switches	2	Three-phase, 15,000 volts, 300 amperes, T. P. S. T.
Compensator	1	6600/2000 volts.
Switches	9	Disconnecting, 15,000 volts, 300 amperes, S. P. S. T.
Meter	1	6000-ampere, watt-hour meter.

Automatic Starting of Substation.

The sequence of operation to put the substation on line, with machine at rest, is as follows:

(a) Positive and negative generator switches (lever type) always closed except when machine is to be off for a long period, such as week end.

(b) Start synchronous motor in usual way by means of remote controlled oil circuit breakers, remote controlled rheostat, and remote controlled field switch.

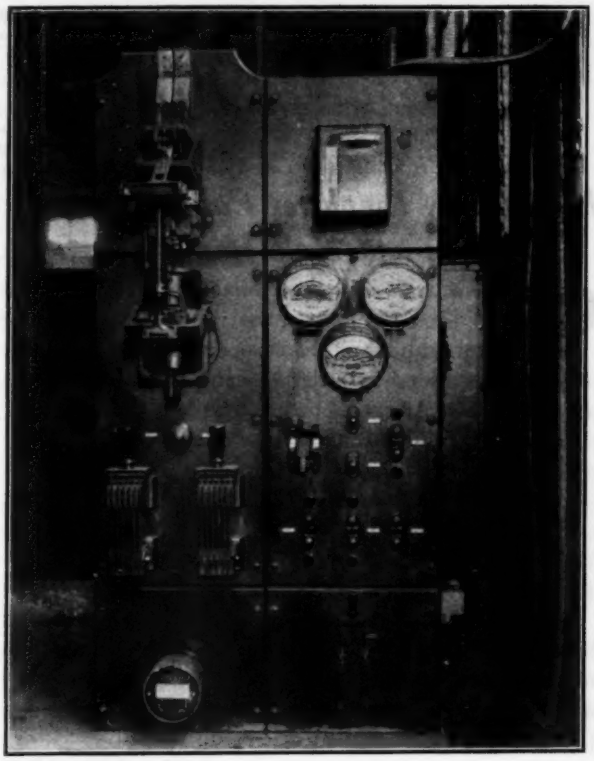
(c) Equalize direct-current voltage by means of remote controlled, solenoid or motor-operated, field rheostat.

(d) Put direct-current generator on line by means of remote controlled, solenoid or motor-operated, single-pole circuit breaker. (This circuit breaker is equipped with overload and reverse current relays, bell alarm contacts with bell in main power station and indicating lamps and signals on pull switch at main station. Circuit breaker is actuated through relay so that current of circuit-breaker operating coil is not handled in control wires between main station and substation.)

(e) Adjust load on direct-current generator by means of remote controlled rheostat.

(f) Adjust field of synchronous motor by means of remote controlled rheostat.

To operate the indicating ammeter in main station, taps for meter leads were taken off power cables at a sufficient distance to give 220 millivolts drop at cables and 200 millivolts drop at meter. (Three pairs of the control wires are paralleled for this connection between substation and main station.) Resistance is inserted at meter to give 50 millivolts at meter terminals.

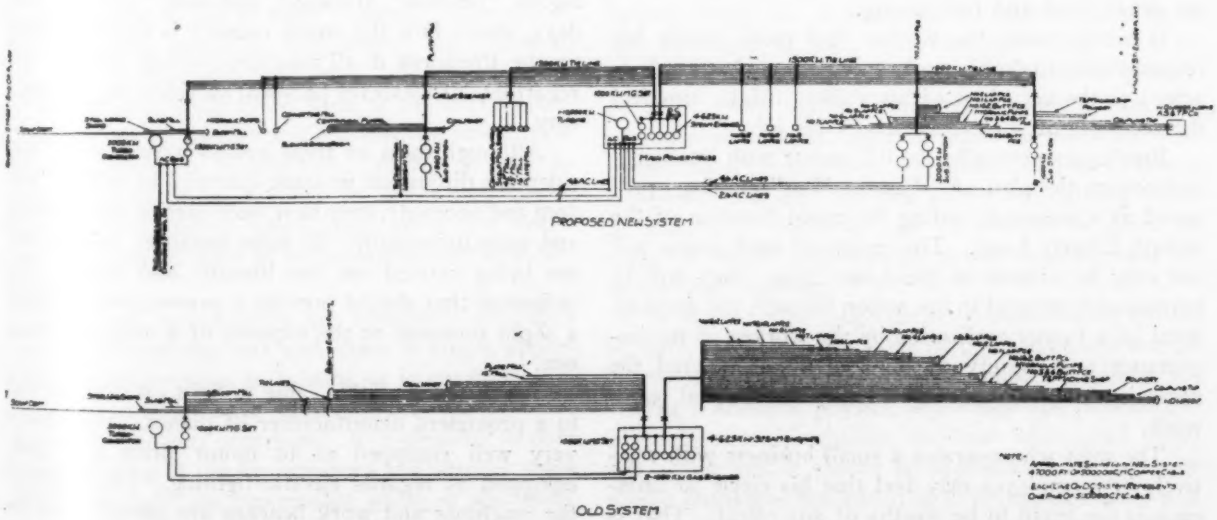


Control Panel.

A simple diagram of the alternating and direct-current generating and transmission systems, without substations, as well as with existing and proposed substations is shown.

The remote controlled substation described was put in operation September 14, 1917, and has been in regular and successful operation since.

The above description was presented at the twelfth annual convention, Association of Iron and Steel Electrical Engineers.



Schematic Diagram of Present and Proposed Energy Generation, Distribution and Utilization.

Editorial Comment

How Every Employer Can Help the Nation and Help Himself

ON PAGES 18 and 19 of this issue we publish the announcement of a plan in which under an organized method the co-operation of every employer is requested in order to help in the promotion of the Fourth Liberty Loan. That announcement is worthy of careful and immediate attention and definite action.

It is certainly not difficult to see how the energetic carrying out of this plan may produce results helpful not only to the Liberty Loan but to American business generally.

The tremendous impetus which Charles M. Schwab has given to shipbuilding has been largely achieved by making every individual engaged in the industry feel a personal responsibility for results and a personal pride in helping to make great results possible.

This spirit of accomplishment in the shipbuilding industry has been brought about by the leaders—the employers—the bosses, whatever you choose to call them, making it a business to come in personal contact with the workers and to inspire and enthuse the men with a sense of the importance of their work for victory in the war—a sense of personal responsibility, and a spirit of teamwork.

The creation of that spirit among the workers of the nation in all lines of activity would be of incalculable benefit to the workers themselves, to employers and to the nation.

Concretely two of these results would be:

To quicken and increase the response to all war measures such as Liberty Loans, War Savings Stamps, the draft, food and fuel saving.

It would make the worker feel more keenly his responsibility to do his work (no matter what its character) to the very best of his ability. Make him feel the necessity of sticking closely to his job.

Employers generally should pursue with intelligent enthusiasm the plan of "Win-the-War" meetings proposed as a means to aiding the rapid flotation of the Fourth Liberty Loan. The results of such action will not only be helpful in the Loan drive—they will be permanently helpful to the nation through the development of a keener realization by the worker of the importance and dignity of his individual job and the necessity for personal responsibility and helpful teamwork.

The man who operates a small business with relatively few employes may feel that his circle of influence is too small to be worthy of any effort. That is a mistake. It is the aggregate that counts, as the announcement of the plan very clearly points out.

The man who is in a relatively small circle may not hold so pretentious a meeting—it may not be formal or run under parliamentary rules—it may not be especially announced, or accompanied by music and oratory. But the man who will quietly call a dozen employes around him and informally, thoughtfully, lead discussion into win-the-war channels, pointing out the importance to the individual of doing his best in support of Liberty Loans and all other war activities, can do a real service in this way. It can be so well done in no other way. And ten thousand such little meetings would produce an enormous aggregate result.

A meeting of this kind may well be the forerunner of similar meetings to be held at appropriate times during the continuance of the war and be the means of explaining other important national measures. Even after the war such meetings might well be continued to explain business conditions in that friendly manner that promotes co-operation between employer and employee.

Carrying Lighting Curtailment to Absurdity

CONSERVATION of fuel was never so imperative as now if the serious coal shortage of last winter is not to be repeated during the next six months. Everyone is agreed on this and is willing to submit to whatever regulations are found necessary by the Fuel Administration in order to conserve existing and prospective fuel stocks for, first, the military needs and, second, the civil needs of the country. The ready response to the various orders and suggestions of the Fuel Administrator, including the "lightless" nights, "heatless" Mondays, and now "gasless" Sundays, shows how the entire country is loyally backing up the President in all measures to help win the war regardless of whatever personal sacrifice may be necessary.

Although most of these orders have aroused considerable discussion in some quarters as to their wisdom and necessity, they have been carried out promptly and quite universally. In some instances, in fact, they are being carried out too literally and without that judgment that should prevent a person from effecting a slight economy at the expense of a more important one.

An instance of this came to light on a recent visit to a prominent manufacturer of pianos. His plant is very well equipped as to motor drive and fairly equipped as regards electric lighting. Practically all the machines and work benches are placed along the windows so as to utilize daylight to the best advantage. The manager stated that this arrangement and the

daylight work schedule followed made it seldom necessary to use artificial light. It was agreed that this was an excellent system from the standpoint of lighting economy. Surprising, however was the next statement, that since lighting curtailment was urged by the Fuel Administration, artificial lighting had never been used and it was not expected to use it during the coming winter. Questions were immediately asked as to the effect of cloudy days and sudden storms on the production rate and quality of work. Details were not available, however, except that work continued until 5 p. m. every day and electric light had not been found necessary. The manager was interviewed at the city office of the company and it was apparent that he had never visited the plant on a dark day or late in the afternoon of a winter day, or else he was under the impression that daylight saving would in some miraculous manner extend the amount of daylight available in winter.

This was certainly carrying the policy of lighting curtailment *ad absurdum*. In order to save from 15 to 30 pounds of coal a day he was going to refrain from using electric light, while his men would each idle away an hour or more before closing time during the later autumn and winter days. If attempts at working were more than a bluff the amount of material spoiled during these dark hours would equal the cost of many tons of coal. Possibly the thought in mind was that piano making was an unessential industry and that use of electric light therefor would not only bring down on it public wrath for this extravagance but possible shutting down of the plant. Certainly if this glaring waste of labor were allowed when every effort is now being strained to conserve labor and man power, the plant would deserve to be closed.

Fortunately there are only very few manufacturers who would be guilty of such a shortsighted policy as the glaringly ridiculous one described. And yet, while it may be the most extreme case of foolish lighting curtailment as yet brought to notice, there are no doubt countless instances, less serious but almost as silly, being perpetrated every day. Blind cutting off of lighting where plenty of light is needed, replacement of lamps by smaller and less efficient units, occasionally spoiling a satisfactory lighting system by changing small, suitable lamps to fewer and larger, but excessively glaring lamps, these are a few examples of the unwise cases of indiscriminate lighting curtailment.

Thrift and conservation are absolutely necessary if we are to win the war and there is ample opportunity to exercise them in lighting as in anything else. Ways of doing so have been pointed out in these columns on previous occasions. It is pleasing to note that the lighting of display windows and outdoor signs in broad daylight, an inexcusable waste in war time, has practically been eliminated. The continuance of similar lighting to hours when there was scarcely any one on the streets has also been restricted. Floodlighting of commercial buildings for purely advertising purposes, legitimate in normal times, but not essential to success of the war, has also been diminished.

Less spectacular, but far more important, is the marked reduction in use of inefficient and wasteful lamps. Much less in the public eye than the bizarre electric signs along "great white ways," this inexcusable waste has been allowed to go on for years when lamps of three times the efficiency have been available. Even since the first lightless nights order went into effect nearly a year ago, the substitution of the obsolete carbon-filament lamps by tungsten lamps has not been accelerated as much as it should have been.

A good sign of the times is the special program to hasten the old lamps to oblivion which was reported in our last issue. The Fuel Administration has approved it, and on September 15 it becomes effective. In substance it provides for the complete elimination of all metallized-filament or gem lamps and the practically complete replacement of carbon-filament lamps except in the few cases where very violent vibration is met with that would shorten the life of tungsten-filament lamps. To carry out this program entails considerable revision of policies as to lamp renewal by central-station companies and agreement among lamp manufacturers for changing carbon-lamp factories to Mazda-lamp production. Among the difficulties involved is revision of lighting rates to compensate for the more valuable lighting service. It is believed, however, that all these difficulties will be overcome successfully and the outlook gives every promise of effecting very important economies in fuel of much greater extent than those effected by spasmodic lighting curtailment here and there.

The most hopeful feature about the new movement is that it is constructive and deserves encouragement in all quarters, whereas lighting curtailment can so easily become destructive. The example cited above shows how readily even a supposedly progressive manufacturer can misconstrue the object aimed at in lighting conservation. If he can carry it to such an absurd extreme, what may we expect of the general public? The lighting interests, however, can and should now take an aggressive part in the movement of educating the public to appreciate that fuel economy is now the real goal and that as regards lighting it can be promoted chiefly by use of efficient in place of wasteful lamps and also by prudent curtailment of unnecessary lighting.

In this way the long continued and difficult efforts to teach the public the value of good light will not be neutralized. Illumination is a complex problem involving economics, physics, physiology and psychology. The educational campaign to show what good lighting is and that it should be appreciated has been an almost thankless one and it is to be hoped that it will not be further vitiated by further misdirected efforts in the direction of economy.

Week's Events

Illinois Contractors to Meet—The Regulations Governing Issuance of Export Licenses—Electrical Future of Belgium

ILLINOIS ELECTRICAL CONTRACTORS TO MEET.

Interesting Program Arranged for Two-Day Convention at Peoria, September 19 and 20.

A program of interesting papers and reports has been arranged for the convention of the Illinois State Association of Electrical Contractors and Dealers which is to be held in Peoria, Ill., September 19 and 20.

A meeting of the State Executive Committee will be held on Thursday morning at 10 o'clock and the convention will open at 2 p. m. The program is as follows:

Address of welcome; response by J. A. Weishar, chairman State Association.

"What the National Association Is Doing to Develop the Merchandising Business," by Fred B. Adam, chairman National Merchandising Committee.

"Selling the Electrical Idea to the Public," by H. A. Ross, Illinois representative, Edison Electric Appliance Company.

FRIDAY SESSIONS.

"Bringing Modern Electrical Conveniences to the Farm," by C. M. Caldwell, chairman State Farm Lighting Development Committee.

"Where the Industry Stands Today," by W. L. Goodwin.

"Some Pertinent Facts About Estimating," by John R. Smith and A. McWilliams, Electrical Estimators' Association, of Chicago.

"How the Government Views the Contracting Business," by Sullivan W. Jones, Washington representative of National Association.

"How the Jobber Views the Electrical Business," by George Loring, president R. I. Electric Company.

"The Facts About Liability Insurance," by Lynton Block, Utilities Indemnity Exchange.

REGULATIONS GOVERNING THE APPLICATION FOR AND ISSUANCE OF EXPORT LICENSES.

The War Trade Board announces the adoption of the following regulations with respect to the issuance of export licenses:

(A) Hereafter licenses may be granted by the War Trade Board only upon application of the consignor and only to—

(1) Corporations organized under the laws of the United States, or of any State, Territory, or possession of the United States or of the District of Columbia, or

(2) Residents of any State, Territory, or possession of the United States or of the District of Columbia, or

(3) Foreign partnerships with a member who is a resident of any State, Territory or possession of the United States or of the District of Columbia, or

(4) Foreign corporations actually maintaining in any State, Territory, or possession of the United States or in the District of Columbia an established branch or agency for the regular transaction of its business, or

(5) Any foreign government acting through any member of its embassy or legation accredited to the United States, or

(6) The Traffic Executive of Great Britain, France, Italy, and the consul for Belgium, or

(7) Any official, firm, or corporation appointed by any department or agency of the United States Government to act in its behalf.

(B) Applications for Export Licenses, and Supplemental Information Sheets and any other supplementary documents or letters relating thereto will only be considered by the War Trade Board when filed by such corporations, firms, or individuals and only when signed in ink by—

(a) An official duly authorized to act on behalf of a corporation if application for an export license is made by a corporation.

(b) A member of a firm if application for an export license is made by a firm.

(c) An individual himself if application for an export license is made by an individual.

(d) A regular employee of a corporation, firm, or individual making an application for export license if such employee has been duly authorized in writing to so sign on behalf of such corporation, firm, or individual and if such authorization has been filed with the War Trade Board.

(e) An attorney in fact of a corporation, firm, or individual making application for an export license if such attorney has been properly authorized so to act by virtue of a power of attorney duly executed and filed with the War Trade Board.

(f) A person duly authorized to act in their behalf if application for an export license is made by a foreign government, the traffic executive, the consul of Belgium, or an agency of the United States Government.

These regulations are effective as to all applications for export licenses filed on and after September 20, 1918.

FEDERAL COURT APPROVES TOLEDO RAIL-LIGHT FARES.

Holds That Company Is Entitled to Earn Fair Return on Investment.

The Toledo Railways & Light Company scored a sweeping victory over the city of Toledo in the fare controversy of the last three months, according to a decision handed down in the United States District court for the northern district of Ohio by Judge John M. Killits on August 2. Not only does the court hold that the present five-cent fare with a one-cent transfer charge is legal, but also that the Doherty company is justified in making further increases if the present rate

is found inadequate. Mayor Cornell Schreiber was taken to task for what the court called "an arrogant attitude, and his attempt to speculate on rates."

Judge Killits opens his decision by stating that fare rates should be fixed by a city, and only unfairness or failure to act can bring the court into such a controversy.

ASSOCIATION OF EDISON COMPANIES ELECT OFFICERS.

At the meeting of the Association of Edison Illuminating Companies, held in New York, N. Y., September 10, the following officers were elected for the ensuing year:

President, L. L. Elden, Boston, Mass.
Vice-president, Robert Lindsay, Cleveland, O.
Secretary, H. T. Edgar, Boston, Mass.
Treasurer, W. W. Freeman, Cincinnati, O.
Executive Committee: Charles L. Edgar, Boston, Samuel Insull, Chicago, J. W. Lieb, New York, J. B. McCall, Philadelphia, and W. F. Wells, Brooklyn.

TELEPHONE SUBSCRIBERS MUST PAY MOVING COSTS.

Order Provides Scale of Charges Based on Monthly Bills for Service.

The Postmaster General has issued the following order relating to charges for installing telephones:

Owing to the necessity for conserving labor and material and to eliminate a cost which is now borne by the permanent user of the telephone, a readiness to serve or installation charge will be made on and after September 1, 1918, for all new installations, also a charge for all changes in location of telephones.

Installation charges to be as follows:

Where the rate is $2 a month or less	$ 5
Where the rate is more than $2, but not exceeding $4 a month	10
Where the rate is more than $4 a month	15

The moving charge to the subscriber will be the actual cost of labor and material necessary for making the change.

In accordance with Bulletin No. 2, issued as of August 1, 1918, stating that "until further notice the telegraph and telephone companies shall continue operation in the ordinary course of business through regular channels," in all cases where rate adjustments are pending or immediately necessary they should be taken up by the company involved through the usual channels and action obtained wherever possible. In all cases, however, where rates are changed such changes should be submitted for approval.

COKE TO HELP RELIEVE COAL SHORTAGE.

Seventy per cent more coke than ever before will be available this year to help solve the fuel shortage. This supply will be further increased by the development of tar, coke-oven gas and other byproducts newly dignified in war time as available fuels. These were some new facts presented to the American Institute of Mining Engineers in session at Colorado Springs last week, in their effort to fill some of the country's needs.

Pulverize coal to attain the greatest efficiency was the theme of another fuel subject before the mining engineers. Some of the advantages of pulverized coal were stated as follows: the utilizing of every heat unit in the coal, the reduction of labor for handling coal, the maintenance of a constant temperature in the furnace.

The mining engineers were also told that coal mining in Washington had proved less profitable in recent years because of the extensive use of fuel oil. It was predicted that higher prices for fuel oil would increase the mining of coal on this part of the western coast.

THE ELECTRICAL FUTURE OF BELGIUM.

Plans Already Under Way to Rehabilitate Electrical Systems—Complete Electrification Proposed.

By ALBERT H. BRIDGE.

For some time past electrical experts who are intimately acquainted with the position of Belgium and Northern France as it was in regard to electric supply before the war, have been preparing plans for electrification of the invaded parts on the most up-to-date lines as soon as ever practicable after their lands are freed from the grip of the enemy. Interconnection and super-power installations, affording abundant power supply for industrial and all other purposes and ensuring economy of fuel consumption, which from the basal principles of British schemes advanced during the last year or two, are also those upon which the Belgian and French authorities are proceeding in elaborating their recommendations. It is recognized in regard to these countries as it is in the case of England, that industrial efficiency and the well-being both of employers and workers demand for the conditions that may be expected to obtain after the war, a sufficient and economical supply of electric power to serve practically all industries. It may be that such a provision may be more readily secured in countries where, when peace comes, industrial operations will have to be practically begun all over again, owing to the interference with machinery and network of distribution systems which is understood to have taken place.

At certain periods during the past four years Belgian electrical men in England and elsewhere have given very anxious thought to the question of freeing themselves from the German grip upon their electrical industries, a grip which was getting tighter and tighter up to the outbreak of war. This matter has not been so prominently under public discussion of late as it was in the days when the war was expected to be one of short duration. Plans, however, have been advanced by some Belgian industrial authorities for enabling them to carry on their industries independent of German capital, financiers, and agents of the big electrical companies having their headquarters in Berlin, but naturally little can be done in these matters under existing circumstances. Though practical measures in that connection cannot be carried far until Belgium regains her liberty and one can better understand the state of electrical manufacturing facilities when the enemy withdraws, it is possible to look ahead with fairly definite plans respecting the electric power requirements that will arise if the work of rehabilitation and reconstruction is to be carried out on the most up-to-date principles. For more than eighteen months there has been in existence a Committee of Investigation for the pooling of the production of electricity in Belgium and a full report on the subject is expected to be published shortly. Joseph Carlier, who was assistant Professor of Railways at Liege University, put his conclusions on the subject before the London committee of the Enquête Economique du Gouvernement Belge several months ago. Bearing in mind that there

were before the war 26 important power stations and a considerable number of small ones he advises that the whole matter be taken in hand on such a scale that not only the immediate and prospective requirements of industrial power will be met, but provision shall also be made for extensive railway electrification. Therefore following the lines of experts who are engaged on similar questions in other countries, M. Carlier advocates the setting up of super power stations at Ostend, Ghent and Antwerp, and in the colliery districts of Mons, Charleroi, Liége and Limburg, which will serve the 26 power stations mentioned on a 80,000 to 100,000-volt network. If the railway electrification scheme is adopted it will require, says M. Carlier, 250,000 kilowatts, and basing his estimate upon official statistics he calculates that 500,000 kilowatts more will be needed for industrial power purposes. In addition he looks ahead at the probable demand for industrial power in five or ten years time and adding another 500,000 kilowatts for this expansion he arrives at 1,250,000 kilowatts as the capacity of the super-power stations. M. Carlier sees that the interests of industrial workers will be served by such a scheme, and he also emphasizes the advantage accruing from the saving of coal, which he puts down at five million metric tons per annum if both the railway and industrial parts of the program are carried out. The power stations would range from 100,000 to 300,000 kilowatts. A still more efficient alternative is covered in his statement—turning coal into gas at the pits for serving a very large system of power stations.

HYDROELECTRIC PLANT ON JOHN DAY RIVER, OREGON, FINDS GOOD DEMAND FOR POWER.

Gold Dredging, Wood-Working Mills, and Chrome Mining Operations Require Electric Power.

The successful operation of the hydroelectric plant of the Prairie Power Company at Prairie City, Oregon, is contributing considerably to industrial activities in that locality. Water is diverted from John Day River, carried three miles down stream in an open ditch, thence 3100 feet through a 48-inch wood-stave pipe to the plant, developing a head of 110 feet. The power plant consists of a Platt Iron Works high-duty water turbine, having a capacity of 700 horsepower, operating at 600 revolutions per minute, driving a General Electric 500-kilowatt generator, wound for 2300 volts, three phase, 60 cycles.

Energy at that voltage is supplied to Prairie City for lighting and power purposes; and is transmitted at 23,000 volts over a 15-mile pole line to a substation situated midway between John Day and Canyon City. At this station the power is stepped down to 2300 volts for distribution to those two towns, and to the dredge of the Empire Gold Dredging & Mining Company, on which there is a connected load of 250 horsepower. This is a bucket dredge, with manganese-steel-lipped buckets. The digging chain, rotary screens, pumps, and other machinery are operated by General Electric motors, resulting in the handling of 3000 cubic yards of gravel per day. Power is supplied for motors amounting to about 200 horsepower to operate box factories and planing mills in Prairie City.

The mining of chrome ores in this locality is creating a greater demand for electric power. It is given out that O. C. Irwin, an electrical manufacturer of Berlin, Wis., will erect a concentrating mill between Canyon City and John Day for treating the medium and low-grade chrome ores. This mill will make a demand for an additional electric load of 200 horsepower. The gangue in which is carried the chrome and iron consists of silica and serpentine, which are readily eliminated by gravity concentration. The high-grade chrome ores are being shipped to consumers of chromic acid without concentrating.

BRITISH ELECTRICAL INSTALLATIONS IN WAR TIME.

Inspector's Report Shows Tremendous Increase in Number of Installations.

In pre-war times the ELECTRICAL REVIEW quoted the reports of G. Scott Ram, the British Government Electrical Inspector of Factories, somewhat fully because they formed valuable practical records of the progress of electrical installations in factories and workshops. The causes of accidents were analyzed, and measures to be adopted to avoid repetition were described. Under the conditions now prevailing it is not possible to cover the ground either technically or statistically in detail, and for some reasons it may not be desirable even if possible. The report for 1917 is therefore brief and general. Mr. Ram refers to the fact that the use of electrical energy has increased enormously in Great Britain during the war, and he shows, what electrical men at least recognize, that the marvelous output attained by munition works of all kinds would have been impossible but for the augmented public supply of electrical energy in the manufacturing districts. The increase was not only for power purposes but for such other uses as electrochemical processes, steel-making, welding, etc.

The demand on the powerhouses has been such that, in many cases, it has been impossible to lay off the plant for overhead or cleaning at the proper times, and shortage of staff has led to longer shifts having to be worked.

Manufacturers of steam and electrical generating plant and switchboards have been very busy, in supplying additional machinery to meet the requirements of the supply undertakings, and manufacturers of motors and accessories for use in the works have been equally pushed. In some districts large applications for power are held up pending delivery of plant. Mr. Ram says that in general new installations, particularly at the larger munition works, have been of a satisfactory nature, the work being well done and in accordance with the Factory Act requirements, although certain exceptions to this rule have been met with.

At many works difficulty has been experienced in obtaining competent electrical engineers to supervise extensions, or to look after plant in operation, and several of the accidents which occurred during the year appeared to have been due to the employment of persons having inadequate training or experience.

In consequence of labor shortage women have been employed in generating stations as general cleaners, and in the cleaning of standing machinery. Others of a better educated class are assistants on the switchboards, working under supervision. In a few substations they are employed on still more responsible work, being in sole charge of the operation of the plant, including the running of motor generators or rotary converters with the accompanying switching and regulating duties. For such work the women have to undergo a period of training under supervision

before being put in charge. The substations selected have also to be suitable as regards the type and protection of the plant, and the duties of the women limited to the routine working. Mr. Ram says that the work of substation attendants is in general more suitable for men, and he emphasizes the need for giving employment to disabled soldiers and sailors in such capacities where their form of disablement permits.

CAPTIVE BALLOONS AID TELEPHONING IN WAR.

Important Advantages in Accuracy and Time Saving.

The possibilities of the captive balloon have led to the organization of balloon service and of balloon troops. As a rule, these troops belong to the Signal Corps, and are charged with the care, maintenance, and use of the material, which includes vehicles for transport, trucks for ascensions, apparatus for generating hydrogen gas, and the necessary supplies, tools, etc. The train accompanying a captive balloon in the field is large, including a reel wagon with its tender, a tool wagon, tube wagons carrying compressed hydrogen, and wagons for the balloon equipment proper.

The advantage of the telephone in immediately transmitting the news gathered by the men in the captive balloons cannot be overestimated. Instead of garbled reports passing through the hands and mouths of a number of more or less reliable messengers, and the elapse of precious minutes, hours, and even days, messages are now delivered almost instantly, by word of mouth, directly from the observer.

The telephone and aircraft have almost entirely dissipated the fog of war. Long before an army reaches the battle-front, its strength and composition are known, its direction and rate of march disclosed, and its purpose revealed. Instead of working in the dark, as heretofore, a commanding general may act in full knowledge of the task before him, and may take suitable measures to checkmate the moves of the enemy in ample time.

Considering the fact that in modern times the firing is not direct, the batteries engaged not seeing the target, one can realize the value of the balloon and the telephone. The nature of the target and its location must be known if the shots are to be effective. It is at this point that the captive balloon and the telephone do their bit, communicating with the commandant of the artillery, aiding him by transmitting valuable information, in the directing of his batteries, so that every shot may tell.

PROBLEMS BEFORE THE ENGINEERING PROFESSION.

C. E. Drayer Discusses Subject Before American Association of Engineers.

The Chicago Chapter of the American Association of Engineers tendered a welcoming dinner at the City Club on the evening of September 4 to its incoming secretary, C. E. Drayer. Isham Randolph acted as toastmaster. W. H. Finley, president of the American Association of Engineers, welcomed the new secretary, who responded briefly and outlined some of the problems now before the profession.

"There is no business but war. Yet we must find time to formulate and attack the large problems that are remotely connected with the war. We may say there are at least six such problems, namely, the status of the engineer, ethics, organization, education, civic responsibility and the relation between capital and labor.

"The status of the engineer is placed first because we cannot make much progress in altruistic work until we are on an economic plane equal to or above the average. It is an absurd situation when the mechanic who executes the plans gets more pay than the man who designs.

"Ethics is a mode of conduct. It differs fundamentally from regulation of conduct by law because it is above the law. It is an inspiration and source of guidance.

"Our engineering organizations must be founded on service to the individual member and through him and through the association to society. We engineers must put aside our jealousies and get together, divide the work to be done among existing organizations in accordance with their past development and capacity. The local chapter or local society is the foundation. Strengthen and build them up and the strong central headquarters which is also desirable will be a natural consequence.

"There is something lacking in the educational system of our technical schools for the reason that their graduates think their duty will be confined to the application of the laws of physics and mathematics to the problem of life.

"Each community has its own civic problems to which it invites the engineer. That he is not on various committees of Chambers of Commerce and other civic organizations making his influence felt everywhere, is due principally to the attitude of mind which he brings from school. Almost everywhere right now there are civic problems internally connected with the war calling for engineering thought."

Joseph Harrington, fuel administrative engineer, State of Illinois, and Dr. H. W. Nichols, secretary of the Chicago Section of A. S. M. E., were guests of the Chicago Chapter and gave their views on engineering organization interrelation in Chicago. Both emphasized the need of Chicago engineers getting together in strong organization relations.

PROVIDING HOMES FOR RETURNED SOLDIERS.

Laudable Recommendations Made by Secretary Lane.

Secretary Lane presented to the President and to Congress recently a comprehensive plan for a preliminary study of the unused lands of the country, with particular reference to the irrigation of some 15,000,000 acres of arid land, the drainage of between 70.000,000 and 80,000,000 acres of swamp land, and the clearing of approximately 200,000,00 acres of cut-over or logged-off land, with the purpose in view of reclaiming these lands through Governmental agency and providing homes for returned soldiers.

That the Secretary's plan has met with wide approval has been made evident by the large amount of favorable comment in the daily press, and by senators and congressmen. It is recognized universally that a man who offers and risks his life to defend his country is entitled to own a part of the land he would give his life to defend. Moreover, it is also appreciated that the ownership of land by soldiers assists very much in demobilization. Many of the French soldiers own farms.

Commercial

Co-operative Meter Reading—Installation Costs for Electric Range—Electrically Equipped Municipal Grain Elevator

CO-OPERATIVE METER READING SUGGESTED FOR KANSAS CITY.

Central Bureau Could Handle Meters for All Utilities in a Community at Considerable Saving.

E. W. Hammond, superintendent of the Kansas City Gas Company, has outlined a plan for conservation of man power—and eliminating much waste in the patron's paying of bills—through co-operation in meter reading, and collections, by utility companies. He suggests that meter reading be handled for all utilities in a community, by a central organization, one representative reading all meters on one visit to a house. The same—or a similar—organization could make collections.

In Kansas City, for instance, the meter readers of the municipal water department visit houses once in two months; bills are sent by mail. The Kansas City Light & Power Company's readers make monthly visits, bills being sent by mail. The gas company makes monthly readings, bills going by mail. The telephone company sends bills by mail; but its collectors for pay stations make tours at least monthly. In the case of each of these, no receipt is sent to the customer who pays by check. In each case, however, the patron consumes more or less of his own time when paying by cash at the office. The cash-payer must go to four different places, from the city hall to the light company—about one mile.

A single bureau for meter reading could handle this phase with one-third the labor, Mr. Hammond estimates; and with an even greater reduction in the troubling of households. Their territory would be small, and each meter reader would therefore become well acquainted with each customer's house and habits, and waste less time than is now consumed in returning after failing to gain entrance.

Some Savings That Could Be Effected.

The joint collection bureau suggested by Mr. Hammond would save materially in the number of men and women necessary for handling accounts of public service corporations and departments. There would be a distinct saving in postage—and in the burden on the postal service—through sending all public service bills in one envelope; possibly the bills could be delivered by messenger, as one public service organization did for a while. Customers could pay all the bills in one check—important conservation of work in banks, where the burden of small checks is becoming a subject of comment. Those who pay cash, could do so at one office for all bills; and substations for paying such bills could be established.

Mr. Hammond has presented his suggestion to the American Gas Association, of which he is an active member; and it is understood that its officers are now planning to present the program to other public service organizations.

LOW INSTALLATION COSTS FOR ELECTRIC RANGE.

Experience on Pacific Coast Indicates Cost Does Not Exceed $50 Per Customer and Frequently Is Less.

There is a very mistaken idea as to the cost of electric range service where attention is devoted to securing installation of ranges on feeders of ample capacity to handle the service and particularly where efforts are made to install ranges in those sections where sufficient transformer capacity is already available to handle the increased range load. During 1917 the Washington Water Power Company's installation costs on 215 ranges requiring additional transformer installations were as follows per range:

Pole line	$20.24
Conductors	31.87
Transformers	38.99
Total	$91.10

In addition to the above ranges, a large number were placed on existing transformer installations, so that the total capital required to take care of range service was less than $50 per range.

During the same period the Utah Power & Light Company, with special efforts devoted to securing range installations on existing transformer installations, had a total capital expenditure per range, with 706 installations, as follows:

Meters	$ 6.94
Service and miscellaneous	15.03
Transformers	6.60
Extension of primaries and secondaries, exclusive of service	4.98
Total	$33.55

Due to the increased cost of materials in 1918 over 1917, the costs for a representative month of 1918 covering 25 range installations were as follows per range:

Meters	$ 9.28
Service and miscellaneous	8.56
Transformers	12.48
Primary extension cost	6.70
Total	$37.02

Following is an example of cost of single range installations where the transformer installation was already ample to care for range service:

25 lbs. No. 4 W. P. wire	$ 7.50
10 lbs. No. 8 W. P. Wire	3.00
1 10-amp. 3-wire meter	8.66
2 No. 1820 strain	.40
2 pins and insulators	.16
Miscellaneous material	.50
Store expense	.50
Labor to install	5.00
Auto expense	1.50
Total	$27.22

In connection with the financing of range sales, central stations which do not care to handle financing themselves should be able to use bank acceptances for this purpose.

In reference to the question of customers not being willing to pay increased cost of electric ranges, this does not work out in practice. Coal and gas ranges

have advanced even more in cost than have electric ranges. As a result, customers seem to be even more willing to purchase the higher priced electric ranges. The customer's ability to purchase useful articles and particularly labor-saving devices seems to be greater than ever. The increased cost of other fuels is, of course, another contributing factor in the customer's desire for electric range service.

One interesting result of this situation is that range sales are made with much less effort and considerably less expense than heretofore, consequently reduced sales force does not necessarily mean inability to make range sales.

In reference to the question of scarcity of power supply, the average central station does not appreciate the actual effect of range loads on its system. Five hundred ranges will not increase the peak of the system over 200 kw. and in many instances much less than this amount. The monthly consumption of these ranges amounts to 50,000 kw-h., which gives a load-factor of 34.7 per cent; 2.7 cents net is a very satisfactory rate for this class of business, as it results in earnings of $75 per kilowatt where the average annual earnings of customer are $30 per year and $100 per kilowatt of system maximum demand where the earnings are $40 per customer per year. When investment costs for range service are held down to a figure between $35 and $50 per range, no objection to high investment cost should be made.

Maintenance Costs of Ranges.

The Electric Range Committee of the Northwest Electric Light and Power Association, in its report before the eleventh annual convention at Portland, September 13, presented in addition to the foregoing data some interesting facts regarding the low maintenance costs of electric ranges. From one western company, during the 12 months ending April 30, the following average maintenance costs obtained for each range installed:

Labor	$1.44
Material furnished by manufacturer	3.52
Material furnished by company	.14
Miscellaneous expense	.41
Total	$5.51

Records of one central station show the following figures with regard to cost of maintaining ranges for the first five months of 1918:

	Cost of repairing.	Av. per range in use.	Av. cost per call.
Labor	$1,073.64	$0.57	$0.71
Materials, manufacturer	2,948.50	1.56	1.94
Material's company	312.15	.12	.21
Miscellaneous	397.97	.22	.26
Total	$4,732.26	$2.47	$3.12
Less $2,948.50 replaced by mfgr.	2,948.50	1.54	1.94
Net	$1,782.76	$0.93	$1.18

APPLICATION FOR RATE INCREASE DENIED QUEENS BOROUGH COMPANY.

The Public Service Commission for the First District, New York, has denied the application of the Queens Borough Gas & Electric Company for permission to increase its rates, as a war emergency, from $1.15 per thousand cubic feet to $1.40 per thousand cubic feet for gas, and from 12 to 14 cents per kilowatt-hour for electricity. The motion was adopted by a divided vote, Commissioners Whitney, Harvey and Kracke constituting the majority in favor of denying the application, while Chairman Hubbell and Commissioner Ordway opposed the motion, the two latter holding that an emergency existed entitling the company to some relief. The prevailing opinion, written by Commissioner Kracke, contended that the evidence at the hearing was not conclusive as to an emergency and discussed the soaring prices of gas oil and their serious effect, not only upon consumers of illuminating gas, but upon the gas companies as well. Commissioner Kracke recommended that at an early date the Commission name a special committee to take the matter up with the various Federal authorities, with the view of protecting the public rights in regard to gas oil conditions.

ELECTRICALLY EQUIPPED MUNICIPAL GRAIN ELEVATOR WILL HAVE CONNECTED LOAD OF 1500 HP.

Some Interesting Features of Electrical Installations at Portland, Ore.—Central-Station Power to Be Used.

By W. A. Scott.

The electrical features of a municipal pier and grain elevator under construction at Portland, Ore., are of considerable interest. All building and pier construction is of concrete. The pier has a length of 1200 ft. along the slip front, and a width of 216 ft. There is one adjustable and one fixed ramp, both electrically operated, reaching from the lower to the upper pier level, there being a vertical distance of 15 ft. between levels.

The site of these improvements is on the right bank of the Willamette River, at St. Johns, a suburb of Portland.

All elevating and conveying machinery will be equipped for electric drive, with silent-chain transmission. Electric energy is to be supplied by the Portland Railway, Light & Power Company. This will be delivered at 11,000 volts to eight Allis-Chalmers transformers, being installed by the Commission of Public Docks. These consist of three 250-kv.a., and five 50-kv.a., by which the voltage will be stepped down to 440 for dock, pier and elevator power and lighting purposes. The wiring is all in Sherarduct conduit, in which the Standard Underground Cable Company's copper wire is used. This branch of the electrical work includes an elaborate light and bell signal system, in which the Holtzer-Cabot signaling apparatus is being installed; the Crouse-Hinds Company condulets for lighting; an interconnected telephone system, and complete fire-alarm devices. Provision is made for 1035 lighting outlets and 170 lighting circuits.

There are to be installed 47 Allis-Chalmers alternating-current, induction motors, wound for three-phase, 60 cycles, amounting to a connected load of 1516 hp., all to operate at 440 volts. The power requirements are for motors of capacities ranging from 100 hp. down to two. There are two of 100 hp. each, three of 75, four of 40, three of 25, six of 20, and 19 others of smaller capacity. All motors for elevators and conveyors are equipped for safety control.

The electric motors and transformers were purchased of the Allis-Chalmers Company by the Commission of Public Docks. NePage-McKenny Company, of Portland and Seattle, has in hand the entire electrical installation under a sub-contract from Grant Smith & Company, who have the general contract. Plans and designs of the dock, pier and grain elevator project were made in the office of G. B. Hegardt, engineer for the Commission of Public Docks, but with Witherspoon-Englar Company, Chicago, acting in a consulting capacity. Cecil Hodgson of that company was recently in Portland in consultation as to the electrical work.

Operating

Protecting Linemen From Poles Rotted at Butt—Interesting Transmission Line Towers—Cleaning Dirty Insulators

PROTECTING LINEMEN FROM POLES WITH ROTTED BUTTS.

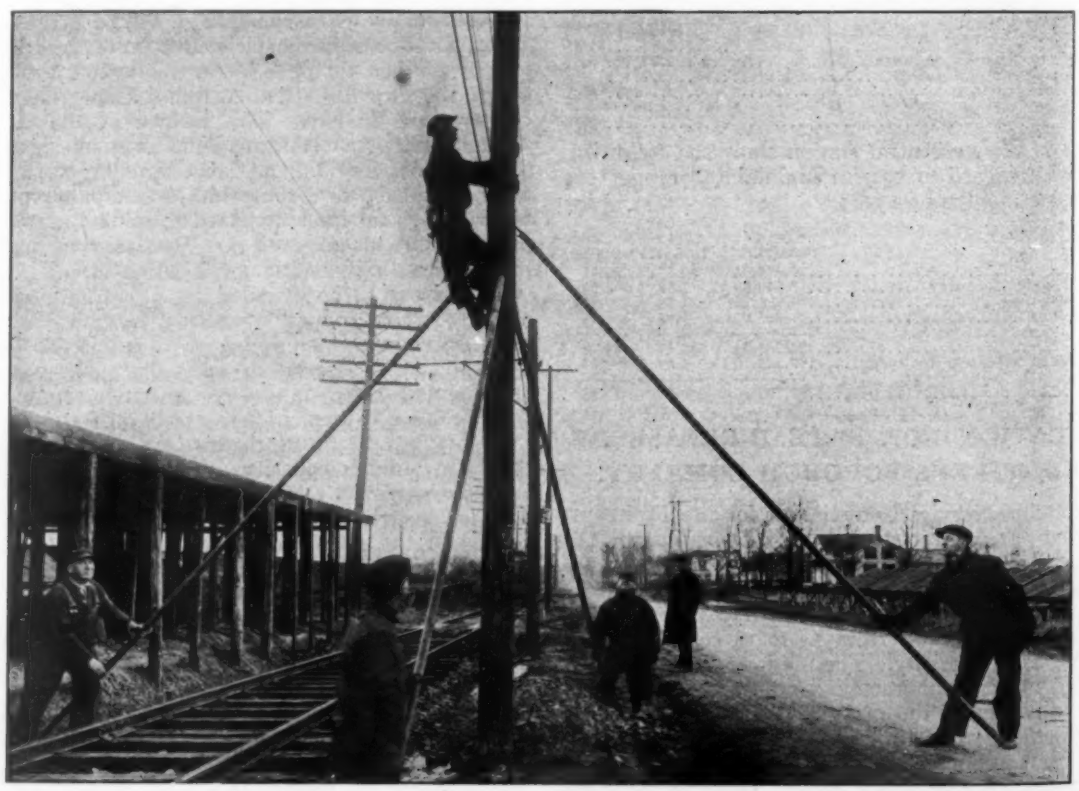
Precautionary Measure in Vogue with Syracuse Lighting Company.

At the present time when all forms of labor are extremely scarce, there is a rather natural tendency on the part of employers to use as few men on a job as possible. It is not a matter of choice, but of necessity. Under these circumstances the safety movement is prone to, and too frequently does, suffer, partly because the men on the job are hurried in their work, partly because there are too few men in any case.

This condition exists to a marked degree as regards linesmen, because this class of labor has been steadily becoming scarcer. For example, whereas it was the practice with many companies to never allow a lineman to work single-handed upon live circuits of a voltage above 600 volts, today helpers or assistants cannot be obtained and men have to go out and work and hunt trouble alone. One instance where care is needed is when linemen are called upon to work on poles whose bases or butts have rotted, especially when these poles are being removed, conductors placed underground and the lineman is up the pole removing guy wires and other structures that help to support the pole. If great care is not taken, the weight of the lineman, lacking the support of conductors or guys, may cause the pole to topple over with very serious results to the lineman carried away with it. It might here be pointed out that when working on poles where rot is advanced, or where there is the possibility of failure, that it is on the whole the better plan not to fasten the safety belt around the pole, as if the pole falls there is then no chance of springing clear as the pole comes to earth.

The accompanying illustration shows the way in which the Syracuse Lighting Company protects its men when they are called upon to climb a pole rotted at its base. A lineman climbing a pole under these conditions does it in comparative safety and may wear his safety belt.

Conditioned air assumes greater importance than ever at this time when there is a shortage of both capacity and labor. Conditioned air is air that has been filtered and washed. Being clean, air ducts, end turns, and so forth, are not choked up and are less susceptible to hot spots, shorts and grounds.



Method of Supporting Pole Known to be Rotten at Its Butt, or When Guy Wires Are Removed.

INTERESTING TRANSMISSION LINE STRUCTURES.

Features of Anchor Towers Carrying Circuits Across Miami River at Millers Ford.

In the accompanying illustrations are shown two transmission line towers, installed one on each side of the Miami River, respectively, at Dayton, O. These towers carry the circuits from the Millers Ford station of the Dayton Power & Light Company across the river.

The anchor tower at the station is seen to carry lightning arresters and choke coils, as well as acting as an anchor or strain tower for the river span. Six 6600-volt, 3-phase circuits are carried across the river, each circuit in vertical plane, requiring a span of 850 ft. with maximum sag of about 18 ft. Four overhead grounded conductors of copper-clad wire are also carried, these being anchored to the top of the steel work.

Each 3-phase circuit is protected by choke coils and electrolytic lightning arresters, both of Westinghouse manufacture. The electrolytic arresters are of special interest, since, it is understood, they are the first 3-phase arresters of this outdoor type produced. A steel stairway for use of the man charging the arresters, and a substantial platform along which he may walk in safety can be seen in Fig. 1.

Both towers are set in very solid concrete foundations, those of the station tower being buried, while those of the tower on the far side of the river may be seen in Fig. 2. The station tower can be seen to be heavily loaded up with apparatus, all of which is Westinghouse, very compactly arranged for economy of space without sacrificing reliability. The towers were furnished by Archbold-Brady Company. Thomas E. Murray, New York, was consulting engineer.

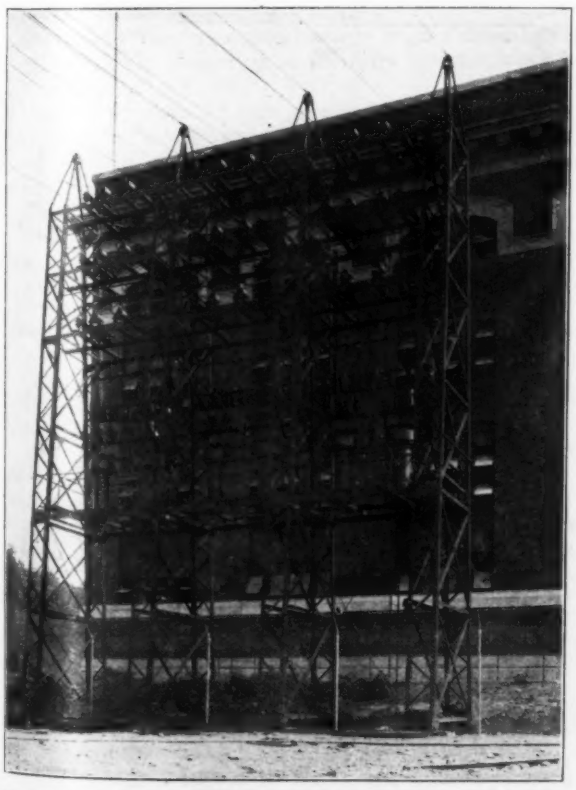


Fig. 1.—Anchor Tower Carrying Six Three-phase 6,600-volt Circuits From Millers Ford Station Across Miami River With 850-ft. Span.

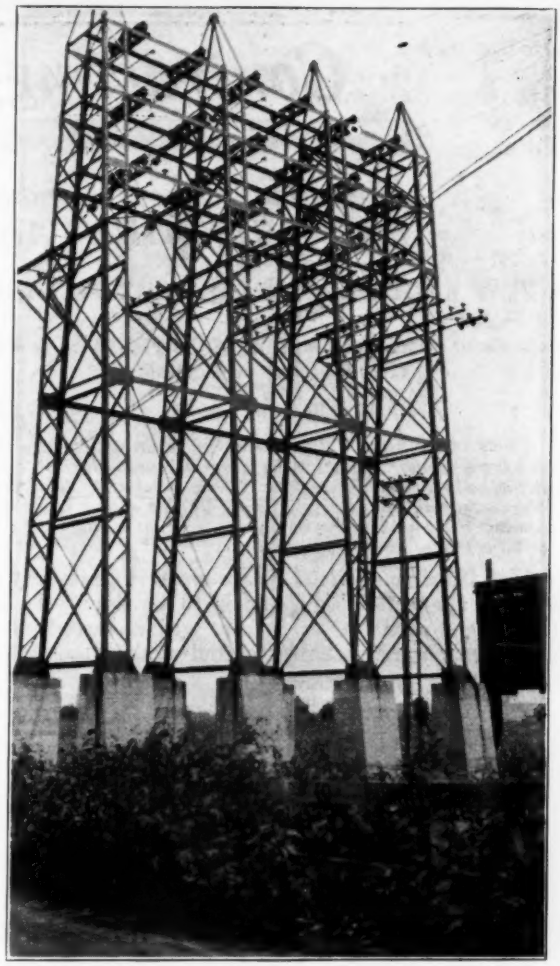


Fig. 2.—Anchor Tower on Far Side of River Used as Anchor and Strain Tower.

CLEANING PORCELAIN INSULATORS.

By P. H. Kane.

A number of years ago the writer had some wiring to do in a manufacturing plant which had been partially demolished by fire. All of the porcelain cleats and insulators were covered with smoke and we, of course, did not wish to use them in the new parts of the building which had been constructed without cleaning them. After much experimenting it was found that the most effective way to clean this porcelain was to dip it into the vat of boiling lye in the plating department. The hot lye removed all of the dirt and grime very promptly. After dipping the insulators in the lye they were washed in hot running water and then placed aside to dry. After having been given this treatment they could not be distinguished from new insulators. In dipping the insulators in the lye, where only a few are to be cleaned, it is satisfactory to hang each one on a wire hanger. However, where a large number of insulators are to be cleaned, the best method is to fill a wire basket similar to those always used in plating departments full of insulators and thereby clean a basketful at a time.

Contracting-Construction

More Facts About Conduit Fishing—Securing the Dead Ends of Turnbuckles—Activities] Among the Contractors

A FEW FACTS ABOUT CONDUIT FISHING.

Methods of Preparing the Ends of the Fish Wire to Prevent Blocking or Fouling.

BY TERRELL CROFT.

[*This is the fourth of a series of seven articles by this well-known author in which he describes and illustrates the best methods and equipment for fishing conduit. On account of the increasing use of conduit systems, this matter is steadily becoming more and more important, so that a discussion of the subject is of timely value.*]

Fish Wire Ends Must Be Rounded in some way or other if most effective work is to be done. If the straight end of a tape or circular wire is forced into a tube, such an end is liable to foul against the end of

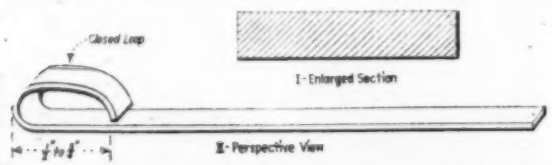


Fig. 8.—Loop Formed in End of Steel Tape or Ribbon Wire Used for Fishing Conduit.

a conduit inside of a coupling. The ends of the conduits should be reamed to a bevel inside and should be screwed together in the couplings until they butt, which will minimize the possibility of fouling. However, in practice the ends do not always butt, which results in the condition just described. Hence, the end of every fish tape or wire should be bent into a closed loop, as shown in Fig. 8. Such a loop will not only slide over the joints between conduit lengths, but it will also permit the tape to be forced more easily around elbows. Furthermore, the loop provides an eye whereby the conductors to be pulled in (or the pulling-in line) can be attached to the ribbon. The loop should be about ½ to ¾ inch long. The ends of steel fishing tapes are often provided with small brass balls, as outlined in detail in the author's "American Electricians' Handbook" These round balls on the

Fig. 9.—Lead Ball Cast Around Loop in Fish-Wire End.

ends of fishing lines are particularly desirable where flexible metallic conduit is to be threaded.

How to Bend the Loop in the Fish-Tape End is the process that is not generally understood. The material of a good fish tape is tempered steel and it must be treated accordingly. Hence, to bend the loop in the end, it should be heated to a red heat and then bent and cooled in sawdust. To insure uniform heating of the end of the wire or tape it has been recommended that it be heated in red-hot lead. Unless a proper bending method is followed, the steel will lose its temper and the eye bent in its end may pull open or be forced open when stress is imposed upon it.

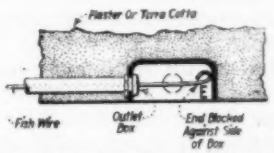


Fig. 10.—End of Fish Wire Blocked Against Side of Outlet Box.

A Loop-and-Ball Fish-Wire End is shown in Fig. 9. This is a variation from the commonly accepted design in that the lead ball cast on the end of the wire, to insure its easy passage through the tube, is formed around a loop so that an eye is provided to which conductors to be pulled in or a pulling-in line can be attached. Furthermore, loops of cord, as described in a following paragraph, and as used in double-end fishing, can be tied in the loop at the end of the ball.

Some wiremen always twist what some call a "longitudinal quarter turn" in the tape or ribbon wire about 2 inches from the ball at its end. That is, they

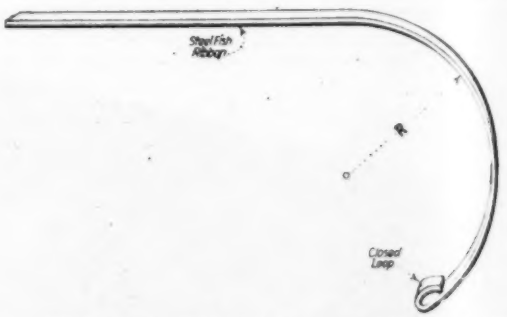


Fig. 11.—Semi-Circular End Bent in Loop for Fishing to Ceiling Outlet Boxes.

twist the ribbon through an angle of 90 degrees. This, it is claimed, tends to permit the wire to pass more readily through the conduit.

A Long-Radius Curl in the End of a Fish Wire facilitates fishing to box outlets. Where the fishing ribbon as ordinarily prepared is used for threading to a ceiling outlet, the end *E* (Fig. 10) is often blocked against the side of the outlet box. Then a ladder must be obtained to disengage the ribbon or it must be

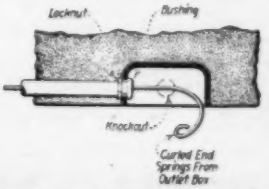


Fig. 12.—Fish Wire Having Curled End Works Out of Outlet Box.

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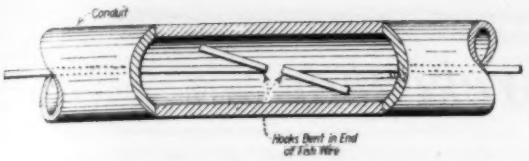


Fig. 13.—Showing Method of Bending Fish-Wire Ends to Insure Engagement.

drawn down from the ceiling with a hook of some sort. If a long-radius curl (Fig. 11) is first bent in the wire it will then, when its end comes out of an outlet box, tend to curl down and out of the box as detailed in Fig. 12, so that the time necessary to disengage an interference like that of Fig. 10 will be eliminated.

In Bending Fish-Tape Ends for Two-Way or Double-End Fishing, a hook must be bent at the working end of each wire, or a hook should be bent in the end of one wire and a loop or eye in the other. Or some similar devices must be adopted whereby the ends of the two wires can be forced to engage within the tube. One method of bending which has been used successfully is that delineated in Fig. 13. Each of the fish-wire ends has a hook at its end but the free portion of the ribbon is bent sideways at an angle to the main line. Where formed thus, the snakes will engage or "hook together" more readily than otherwise.

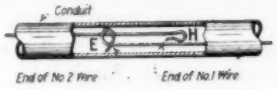


Fig. 14.—Another Method of Bending Fish-Wire Ends for Two-Way Fishing.

Another method of bending involving a loop and a hook is shown in Fig. 14. In this, a hook *H* is bent in the end of one wire and an eye *E* in the end of the other. This device is sometimes successful where others fail.

Still another scheme which has been applied successfully in certain cases is shown in Fig. 15. In this, one snake is of No. 14 round galvanized-steel wire and the other is a steel tape. The end of the steel wire is formed into a corkscrew, as shown at *C*, and the end of the tape into a loop or eye *L*. After the two wires have been forced together within the conduit, the round steel wire is twisted and pushed forward so that its corkscrew turns will engage in the loop *L*. Then both of the wires can be pulled through out of the duct by drawing on either one of them.

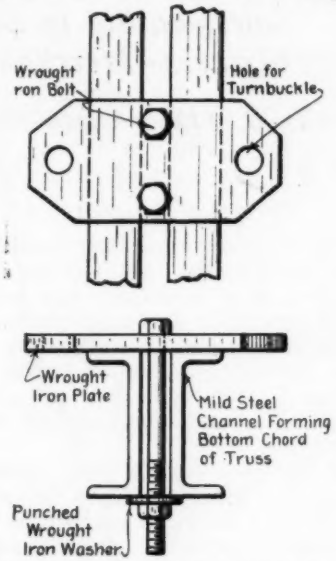
Fig. 15.—Fishing with End of Round Steel Wire Bent into Corkscrew Form.

(To be continued.)

HOLDING DEAD-ENDING TURNBUCKLES AT A ROOF TRUSS.

By Charles L. Bishop.

Where a number of heavy conductors are to be terminated at a roof truss the dead-ending turnbuckles can be held at the truss very substantially as shown in the attached illustration. The device consists merely of a wrought-iron plate of strap iron a quarter to one-half inch thick, which is cut out as shown and which has drilled in it four holes. This plate is clamped to the roof truss as shown below with two bolts. Where heavy conductors are to be supported it is best to always use bolts which are at least five-eighths of an inch in diameter, because experience has shown that workmen are liable to twist off any bolt smaller than five-eighths of an inch in diameter.


Wrought Iron Bolt
Hole for Turnbuckle
Wrought Iron Plate
Mild Steel Channel Forming Bottom Chord of Truss
Punched Wrought Iron Washer

Method of Holding Dead-Ending Turnbuckles at a Roof Truss. Plan and Elevation.

AMONG THE CONTRACTORS.

North Coast Engineering Company, Portland, Ore., is wiring two hotels for the Crown-Willamette Paper Company for lighting, cooking ranges and motors. One hotel is at Oregon City, the other at Camas, Wash.

The Windemere Electrical Company, 13943 Euclid avenue, Cleveland, Ohio, has received the contract for wiring the new residence and garage being erected for Clifford Neff, at Bratenahl, Ohio. The buildings will cost about $20,000.

Richard A. Turner & Company, 46 Taylor street, Springfield, Mass., have received a contract from the Gilbert & Barker Manufacturing Company, Cold Spring avenue, West Springfield, for electrical work in its two new one-story plant additions.

Contract has been awarded to the Reading Electric Company, Chester, Pa., for the installation of electric wiring, etc., in the new office building now in course of construction by the Sun Oil Company at Marcus Hook, Pa. The structure will cost $20,000.

H. LeRoy Baer, proprietor of the Baer Electric Company, a progressive contractor-dealer firm at 314 Park place, Van Wert, Ohio, has been called to service in the United States Army and has therefore discontinued his business. He sent out to his many customers unique cards announcing this fact, thanking them for past favors and hoping to be able on his return to again serve them in things electrical. These cards were decorated on the corners with the Stars and Stripes in natural colors and made an excellent impression on their recipients.

Dealer-Storekeeper

Salesmanship in the Electrical Industry — New Lighting Fixtures—Merchandising Modes of Minneapolis Company

CAN THE SALESMAN CURE THE ILLS?

By Sidney New.

Editor of Contact.

It requires no expert these days to find out that the electrical industry is sick. With all the ills that have been pointed out to us it is surely in a bad way unless these ills can be cured. But where is the doctor who can prescribe and apply the remedy?

We have had enough diagnosticians and specialists to tell us what is wrong with us. Let's call in a practicing physician, if there is one, and get some practice applied to all this theory.

Most of the specialists we have heard from have told us about the heart, the lungs, the stomach, and the bowels of the patient. These organs do not seem to be functioning properly. The stomach tries to breathe at times, the lungs to digest food and the bowels try to pump blood. Just as a layman, I can see there is something wrong.

But I know enough about hygiene to know that if the organs are doing these queer things, it isn't their fault. The real trouble lies in the nerves.

The nerves of the electrical industry are its salesmen. Why confine our attention to the manufacturer, the jobber, the central-station and the contractor-dealer and ignore completely the salesmen that really link these factors together? When the contractor-dealer thinks of the jobber, does he think of the jobber or of his salesman? When the central station thinks of the manufacturer, does he think of the manufacturer or of his salesman?

If we had the right kind of salesmen, right down the line—salesmen who knew more about merchandising and less about electricity—would we not all be better off? Suppose the jobber's salesman who calls upon you, Mr. Contractor-Dealer, could tell you why you are not getting your fair proportionate part of the business and how to go about getting it, could tell you what is wrong with your store and suggest means of improving it—would you think more of your jobber or less? And what would you, Mr. Manufacturer, think of a jobber that had salesmen like that—would you feel inclined to sell direct to those contractor-dealers or let that jobber handle the business and pay him for doing it?

Suppose the manufacturer's salesman who sells to you, Mr. Jobber, could teach you and your salesmen what they ought to know about merchandising instead of simply boosting his line, could give you some intelligent counsel for your salesmen to pass along to their trade about the use of the advertising matter his house turns out—would you push that line harder or throw it overboard?

You see, we've found the doctor. He is the high class clever salesman working for the manufacturer, the jobber, the central station or the contractor-dealer, but particularly the first two. He is the missing link that should bind together solidly the various branches of the electrical industry. Before we can hope to cure the patient we had better cure the doctor.

Doctor Salesman, do you really know enough about your profession to hold your diploma? Do you realize your importance to the industry? Do you know that a large part of the ills of the industry are your fault? That if central stations and contractor-dealers are fighting each other instead of co-operating and dying in the fight, you are to blame?

I know several salesmen who need an education.

First, there is Ord. R. Taker. He considers his customers simply as a dumping ground for his goods. Each one is a hopper that he tries to keep filled up. Far be it from him to try to empty the hopper. His job is to keep the hopper full. If it spills over, so much the better. He would be better off carrying a hod.

Second, comes I. Pushit. He prides himself on his salesmanship. He can push any line successfully. Today he makes a drive on Hotpoint irons and talks a lot of customers into buying a big order. Tomorrow he talks Westinghouse irons and talks so glibly that his customers duplicate their orders. He is a bear of a salesman, but somehow they get tired of him when their capital is all tied up. He is a page from yesterday.

Next comes Cut M. Close, who considers half a commission better than none. His customers make thousands of dollars on their purchases, but, somehow, they lose it on their sales. They love him for his cut prices but he does not keep them in business. Some charity organization needs his services, not a business house.

Then there is First-Name Charley. He keeps his customers entertained while he waits for his train and their customers wait to be waited on. He calls them all by their first names and they like to have him around, so they give him little orders to keep him coming. He would do better on the stage.

There is one fellow I know whose boss was going to fire him the first three months because his sales were next to nothing. He spent his time hanging around his customers' stores doing odd jobs. In one store he helped put the stock in order, in another he trimmed the window, in another helped straighten out the bookkeeping. They nicknamed him "Helpful Harry." After awhile he brought in a few small orders and his boss gave him another chance. Then he spent some more time with his customers, helping them sell what they had bought. His second batch of orders made the boss sit up and notice. When orders for irons in gross lots began to come in from dealers in Squedunk and Rubeville, the boss fired Taker, Pushit, Close and Charley and turned the whole job over to Harry.

There is another salesman they call Sellem Ads. He claims he has not sold a bill of goods in three years. He studies the advertising of the manufactur-

ers, picks out the most complete campaign, then goes out and sells that. He never mentions appliances, just tells all his customers about this wonderful advertising opportunity and how they can hook up to it and sell a whale of a lot of stuff. He sells them the advertising and they beg him for the goods and re-order by mail. "Because," he says, "when you get right down to it, my customers are in business to make money. I show them how." His boss values him highly, too.

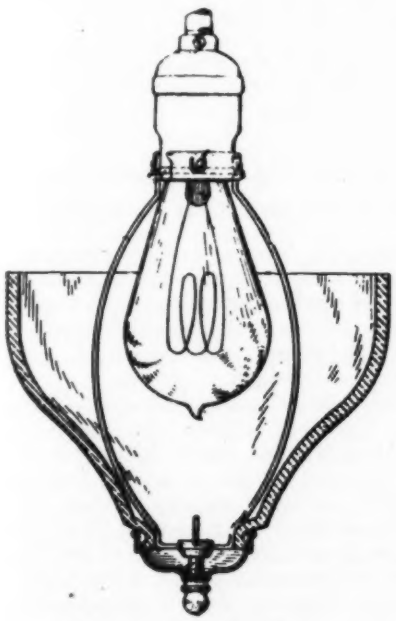
When we can put all our salesmen on the plane of these last two, we shall not have to worry about the ills of the industry. The industry needs merchandising ability, and the only way it will get it is by somebody studying merchandising. There are plenty of books on the subject, but who will read them? Perhaps the contractor-dealer will. Certainly the jobber's salesman and the manufacturer's salesman should.

Mr. Salesman, in whatever branch of the industry you are, don't forget that you are responsible for existing conditions. Whether good or bad, they reflect on you.

THREE NEW TYPES OF LIGHTING FIXTURES.

Recent Patents Show Three Interesting Varieties of Fixtures.

A number of the tendencies in the unending variety of electric fixtures are shown in the appended

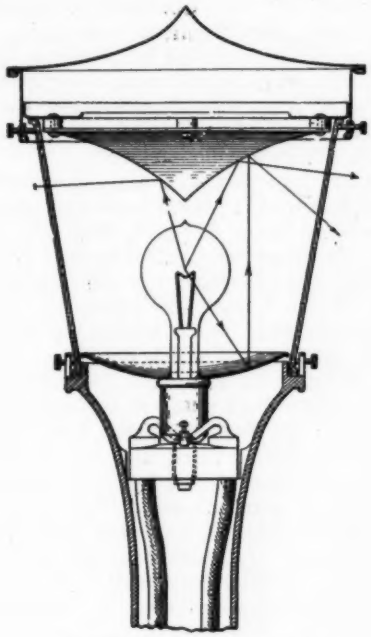


Semi-Indirect Lighting Fixture.

illustrations, taken from the three U. S. Patents recently issued within a week of each other. Thus, Edwin L. White, of Brooklyn (Pat. 1,270,081), supports the bowl of a semi-direct lighting fixture from a pendent lamp socket by a fork clamped to the bowl and terminating in free ends which are secured to the shell of the socket.

Frank Brueggeman, of Chicago (Pat. 1,270,261) uses both upper and lower reflectors in connection with a street lamp for more effectively utilizing the upward and downward rays of light.

The third illustration shows the table lamp of David Crownfield, of Cambridge, Mass. (Pat. 1,270,268). He uses a dome over the lamp and partly shields the latter by an inner bowl which has both its interior and its exterior formed of lozenge-shaped



New Type of Street Lamp.

light diffusing portions. This bowl has a reflecting coating extending only part way down, so that it will directly transmit the more downward rays of light.

In the views of the table lamp and street lamp, the direction of the rays of light are indicated by arrows.

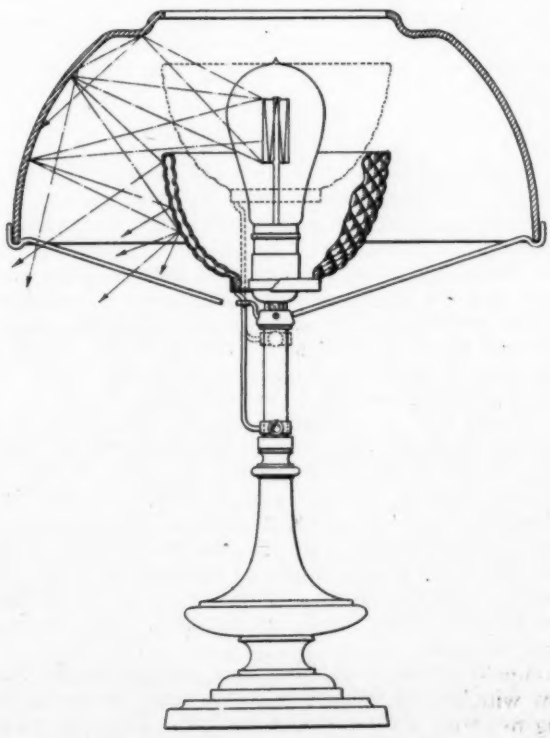


Table Lamp with Unique Features.

MERCHANDISING METHODS OF STERLING ELECTRIC COMPANY.

Details of Sales and Advertising Methods that Have Been Responsible for Company's Unusual Success.

The Sterling Electric Company, Minneapolis, an electrical jobbing, retailing and contracting concern, has developed a combination of systems under one general management, which make for effective co-ordination. Of the three departments, the purpose herein is to speak of the sales and service methods of the retail merchandising department.

Undoubtedly the principal aids in creating a demand for appliances are liberal local advertising, effective window and store displays, and practical demonstrations. Perhaps the greatest of these is the work of the efficient demonstrators—in the company's salesrooms and in the homes of interested, prospective buyers. These are all the indispensable aids to salesmanship, the efficiency of which depends upon the tact and genius to utilize those aids to the fullest extent.

Mention may well be made of the results of a special sales campaign, earlier in the year, on vacuum cleaners. This lasted a week, and the attractive offer made was with reference to terms of purchase, the standard price being maintained. The company has a practice of making no discounts for cash down. The cash customer pays the same price as does the time-payment buyer. For the week above referred to there were 540 vacuum cleaners sold in Minneapolis, St. Paul and Duluth, 268 of this number having been sold in Minneapolis. The attractive part of the offer, as stated above, was the terms of sale, which provided for a cash payment of $2 and payments thereafter of $2 each month, the price of the cleaner being $40. This sale, however, was preceded by a vigorous advertising campaign in the newspapers of the three cities. Especially noteworthy was one advertisement which did good service in linking together two things—an efficient electric cleaner and mighty liberal terms to the purchaser. At the same time the display windows and the demonstrators were pulling their part. This sale was carried through at a time seasonable for vacuum cleaners.

Appliance Sales.

During a 10-days campaign for the sale of electric washing machines, which came in June, 90 machines were sold in Minneapolis and 210 in the three cities of Duluth, St. Paul and Minneapolis. Preceding this sale there was good co-operation between this company and the manufacturer. Deliveries of machines to the company's three stores were scheduled, and the sale was timed to begin soon after delivery. While in this case, a small concession in price was made, the terms of sale constituted the controlling factor.

In the sale of appliances the demonstrator's services are probably more potent in closing washer sales than in selling the other domestic utensils. While the vacuum cleaner demonstrator is usually a man, it is admitted that it requires a woman demonstrator to teach the housewife how to run an electric washer and get her in a good frame of mind to buy one. The tactful, skilful woman demonstrator often develops the gift of selling, and can handle a prospect from start to finish.

Considerable success has been attained by the Sterling company in selling the Ruud water heater in connection with the Gainaday washer. The sale of the ironing machine has been stimulated by inviting prospective customers to bring in their washed clothes and see them ironed free of charge.

A demonstration of how a specially low price of electric flat irons on a cash basis will take, the company advertised such a sale for one day and sold 127 for cash.

A feature of the Sterling's store is its make-up of several bungalow rooms on the second floor of its main building. These comprise small display and demonstration rooms of bungalow design, finished in colors that blend with the surroundings. One, for instance, represents a laundry room, where there may be seen in operation an electric washer, ironer and water heater. Here the customer's attention may be centered on the washday utilities installed in a room no larger than that which she would use at her home for this purpose. Another room contains the vacuum cleaner, and dressing table facilities; another shows the phonolamp and electric fireplace. The improvised kitchen contains an electric range, toasters, table cookers, and other displays. The salesmanship point of all this is the ability to show a kitchen, or a laundry installation, for instance, as an operating unit, entirely apart from the hundred-and-one other features of a big store. It helps to demonstrate, and to rivet attention on the appliance for sale. It shows this appliance in proper relation to other things.

The service department is well equipped for repairs, and in the matter of repairing and supplying parts, a liberal policy is pursued toward customers.

The special valuation placed on the time-payment plan of selling appliances, is that a good business acquaintance arises between company salesmen and customers by reason of the latter coming in many times to make payments. This leads to other sales, because a better knowledge of the various appliances in itself is a stimulator of the desire to have them.

CASH SALES OF ELECTRIC APPLIANCES HAVE INCREASED IN PORTLAND.

A noticeable feature of the electrical appliance business in Portland, Ore., is the increasing number of cash sales of washing machines and ranges especially. Many such sales are to shipyard employes who are drawing high wages. All classes of appliances are widely used in Portland.

The sales department of Portland Railway, Light & Power Company reports the sale of 80 electric washers thus far this year. Electric cooking ranges to the number of 400 are in service here on this company's lines, and 4000 vacuum cleaners. The largest installation of electric ranges is at Tudor Arms apartment house, in which there are 50 of the Hughes make.

While this company sells a great many appliances on the time payment plan, a considerable cash payment down is required, and payments are closed up in 10 months on washer sales, six months on ranges, and three months on sales of percolators, toasters, irons and other smaller appliances.

J. F. Buchanan & Company, 1719 Chestnut street, Philadelphia, Pa., electrical contractors, will do the electrical work in the new manufacturing plant to be erected by the Unit Construction Company at Fifty-seventh street and Gray's Ferry avenue.

The Commercial Construction Company, 8 Bridge street, New York, has received the contract for electrical work in the store and loft building at Fulton street and Galatin place, Brooklyn, now undergoing improvements.

Electric Vehicles

Speeds and Damaged Roads—Electric Crane Tractor Performance—Electric Taxicabs—Truck Sucess in New York

EXCESSIVE SPEEDS OF PONDEROUS VEHICLES DAMAGING TO ROADS.

Preventative and Compensation Possibilities

By A. Jackson Marshall.

Excessive speeding is dangerous and destructive to life and property. Speed maniacs have to their "credit" thousands of lives, and with the greatly increased use of trucks our highways are reflecting the destructiveness of those get-there-at-any-price operators whose selfish attitude tends to place the superior economic advantages of the modern motor truck in a false position.

In these days of stress, with the railroads taxed to carrying capacity, motor trucks have rendered valuable service in transporting vast tonnage. They have not only helped in the emergency, but have also demonstrated their economic value as permanent, flexible adjuncts to fixed transportation routes, and this development may introduce additional regulatory measures.

A snap judgment may consign all heavy-duty vehicles to the class that plays havoc with highways, whereas a truck, properly tired, suitably sprung and moving at rational speed, might damage a highway to a lesser extent than a rapidly accelerated, fast-moving passenger car, or a heavy wagon with narrow steel-rimmed wheels drawn by rough shod horses, the wheels cutting into and grinding the highway, the steel-pointed horses' shoes approximating picks in their penetrating power. Besides, wagons of this sort, principally used by farmers, are usually not overburdened with spring suspension, and as a result, make very effective "hammers," the blows of which may be communicated to sub-surfaces with resultant disintegration.

While weight is a contributing factor to highway wear, within reasonable limits, it is probably of less importance than speed. A heavy road-roller, moving on wide steel wheels, does not damage a road because it proceeds slowly. If, however, such ponderous mass were propelled at high speed the roadway would be damaged. A motor truck with load weighing 20,000 pounds, equipped with suitable rubber tires, properly sprung and moving at a walking pace of four miles per hour, would be unlikely to damage a modern highway to any appreciable extent. But as the speed was increased, so would the damaging influence be increasingly registered on the highway. Theoretically, poundage increases as the square of the speed. While a truck at 4 miles per hour is only moving twice as fast as one going 2 miles, yet squaring the respective speeds (16 and 4), it will be noted that the destructiveness of the vehicle moving faster is four times greater than that of the more slowly moving truck.

Basing Road Tax on Damage Done.

If the above theory would apply in practice, the following formula might provide a basis for equitable compensation for road wear from properly tired and sprung vehicles of different weights when operated at various speeds:

Gross weight (of vehicle and capacity load) × speed squared × a factor = fee.

Example: A "gross weight" of 20,000 lbs., a "speed" (squared) of 10 miles per hour, and "a factor" of 1/100,000 (it may be of any value), we have the problem and result expressed: 20,000 lbs. × 100 × .00001 = $20.00, or $20 the "fee." The following table indicates "fees" at various speeds up to 50 miles per hour, not that such excessive velocities would likely be permitted, but to indicate relative compensation values:

Gross weight (lbs.)	× Speed—Squared	× Factor	= Fee
20,000	5- 25	.00001	$5.00
20,000	6- 36	.00001	7.20
20,000	7- 49	.00001	9.80
20,000	8- 64	.00001	12.80
20,000	9- 81	.00001	16.20
20,000	10- 100	.00001	20.00
20,000	11- 121	.00001	24.20
20,000	12- 144	.00001	28.80
20,000	13- 169	.00001	33.80
20,000	14- 196	.00001	39.20
20,000	15- 225	.00001	45 00
20,000	20- 400	.00001	80.00
20,000	25- 625	.00001	125.00
20,000	30- 900	.00001	180.00
20,000	35-1225	.00001	245.00
20,000	40-1600	.00001	320.00
20,000	50-2500	.00001	500.00

Assuming there would be a maximum speed permissible, which might, or might not, vary with different weights of trucks and equipment, the method of application of such formula could be somewhat as follows: Applicant for license would state (such statement could be checked for accuracy) gross weight of vehicle and capacity load, and the speed same was capable of attaining when propelled over a hard, level surface. In the case of a 20,000-lb. unit, with a speed limited to 10 miles per hour, the "fee," on above basis, would be $20. If possible attainable speed were 15 miles per hour, "fee" would be $45, etc., etc.

Assume that after a license had been granted, an authorized inspector could stop the truck at any time and personally subject same to a level road test. If the speed were greater than that indicated in the license, and perhaps conspicuously stamped on the chassis, reprimand might be in order, or the speed developed in such trial might be employed to raise the "fee" for the remaining unexpired term of the license, or for the life of the truck, for speed. If the trial speed be in excess of that permitted by law, the difference between the "fee" originally paid, plus the amount determined by increased speed shown in trial, and the "fee" indicated for test (unlawful) speed, possibly could be regarded as a fine.

As an example of the manner in which such method would work: Application made for and license issued as follows: Twenty thousand lbs. gross weight of truck and load at 10 miles per hour for which a "fee" of $20 was paid. In road inspection test vehicle goes

30 miles per hour. Legal speed limit, for purposes of example, 15 miles per hour. "Fee" for 15 miles per hour $45. Amount for 30 miles per hour $180. Licensee originally paid $20. Twenty-five dollars additional required to pay for the 15-mile-per-hour license, plus $135 (difference between $45 and $180) as a fine.

Some such control would automatically tend to confine speeds within rational and economic limits, make for greater safety, and equitably distribute cost of road construction and maintenance.

HAULING WOOD ELECTRICALLY.

Economy of Electric Transportation Demonstrated.

As an old adage states—"Charity begins at home," it seems natural for a charitable organization to practice this principle, especially as by so doing it conserves its resources, enabling its humanitarian activities to be more extensively enjoyed.

The Charity Organization Society, of New York City, in delivering kindling wood is using two electric trucks and five horses instead of from twelve to fifteen horses as formerly. The "electrics," the first of which was installed in 1912, have from the start shown themselves to be far less expensive to operate. In fact, the economies of the first electric led to the purchase of a second, for the storage battery vehicle could deliver eight cords a day at a total cost of $12.73, while it took two two-horse teams, costing $18.00 a day to do the same work. That saving of $5.27 is the reason why the second electric was bought the following year.

During the year ending September 30, 1917, these two electrics between them delivered 2663½ of the 3540½ cords of kindling that went out of the West 28th Street yard of the Charity Organization Society. The total operating cost of the two vehicles for the year was $5491.80, or an average of $2.02 per cord. The five horses in the service of the yard delivered 877 cords, at a total expense of $4,904.74, or an average of $5.59 per cord. The figures are based on an all-year-round service, which, in part, accounts for the big difference.

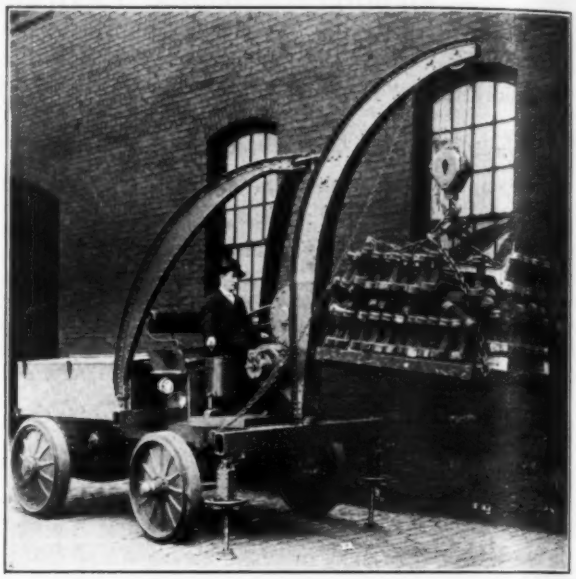
ELECTRICAL VEHICLE CRANE TRACTOR.

In the ELECTRICAL REVIEW, issue of June 15, 1918, was described a recent addition to the electric vehicle family. This newcomer was a storage battery crane tractor of 2-ton lifting capacity, the same storage battery being used for lifting and traction.

The demand for this mobile electric tractor crane was created principally through war conditions and the consequent handling of some plants of many heavy materials in large units. This electric crane tractor, although it has not as high a lifting capacity as many locomotive and overhead cranes, has, however, the advantage of being more flexible in its radius of action.

Recently one of these electric crane tractors was observed unloading a freight car at a well-known terminal. It was handling large crates of army kitchen equipment weighing approximately 3700 pounds. After lifting the cases off the freight car, it backed away, and running across the pier under its own power, depositing its load. While this is a somewhat larger load than the electric crane tractor was figured to carry while in motion—the manufacturers would prefer loads to be limited to 2000 or 3000 pounds in such instances—the ordinary stationary crane having only a maximum capacity of 4000 pounds—the electric crane tractor performed its duty easily. The boom of the electric crane tractor swings 180 degrees so that after material is lifted it can be deposited easily on the ground or on a trailer for transportation elsewhere.

It can be readily realized that speed in handling materials is vital under present conditions. Locomotive or overhead cranes are not always available at just the place where it is necessary to handle material at a given time, and even if available, they cannot always be transported quickly from one point to another as can an electric crane tractor of this type.



Storage Battery Tractor Crane.

This electric crane tractor is also equipped with a spring drawbar coupler at the rear of the frame. It is possible therefore to load trailers by means of the electric crane and then haul these trailers electrically to another point and unload them. As a tractor it can haul a gross trailing load of 15 tons. Electric tractors of this type have been used in many instances to "spot" loaded freight cars, either pulling or pushing them.

The above mentioned electric crane tractor is another member of the electric vehicle family which embraces light and heavy duty commercial (street) trucks, passenger cars, electric wheel chairs, canoes, electric industrial trucks and tractors, including those equipped with cranes and self-elevating platforms, which are contributing no small part in our successful war operations, as they not only expedite the rapid and economic movement of materials and munitions, but, by virtue of their gluttony for work, are releasing thousands of men otherwise needed. In fact, many of these vitally necessary small but powerful electric vehicle transportation units are being operated successfully by women.

THE ELECTRIC VEHICLE IN SPAIN.

At present gasoline costs in Spain in the neighborhood of $2 per gallon and consists of about 50 per cent alcohol. Its use is not permitted by passenger cars and only very restricted quantities are available for commercial truck use, most of the precious fluid being reserved for Government transportation requirements. While this condition is abnormal and likely to be relieved with the return of peace, the cost

of gasoline, even then, in Spain will likely continue at a well nigh prohibitive figure. On the other hand, electric current, largely produced by water power, is at this time available for charging electric vehicle batteries at 1½ or 2 cents per kilowatt-hour. When it is realized that in America the electric vehicle more than successfully competed with the "gas" car with electric current at from 5 to 7½ cents per kilowatt-hour and gasoline at from 12 to 15 cents per gallon, the economic superiority of the electric vehicle can be appreciated, especially when considered in connection with prevailing prices in Spain.

Spain is now learning what many other foreign countries have learned by experience during the four years of war. Economy of operation necessarily had to be adopted, besides employing transportation units which could be depended upon for uninterrupted service, and which required minimum mechanical supervision and repairs, and whose simplicity of operation permitted the use of young men, old men and women not otherwise required in direct war work. The electric vehicle has answered these requirements and, as a consequence, is being employed in ever-increasing quantities. The demand for American built electric vehicles by European countries continues to exceed the supply and available shipping facilities.

THE ELECTRIC TAXICAB.

Successful in America—Their Use Increasing Abroad.

The electric taxicab installations in several American cities continue, after prolonged and exacting tests, to give excellent service. Their cost of operation is considerably below that of gasoline taxicabs and none of this type approach the "electric" in quality of service, including safety, cleanliness, noiselessness, dependability, absence from obnoxious odors, and ability to negotiate quickly dense traffic encountered in thickly populated urban districts.

Shortly prior to our entrance into the war, plans were maturing rapidly for the inauguration of extensive electric taxicab service in New York, Philadelphia and other large cities—the initial installation in New York City was to have consisted of 500 such cabs which were to have been augmented to meet the inevitable demands which were anticipated. When financial conditions will permit, this development will be launched.

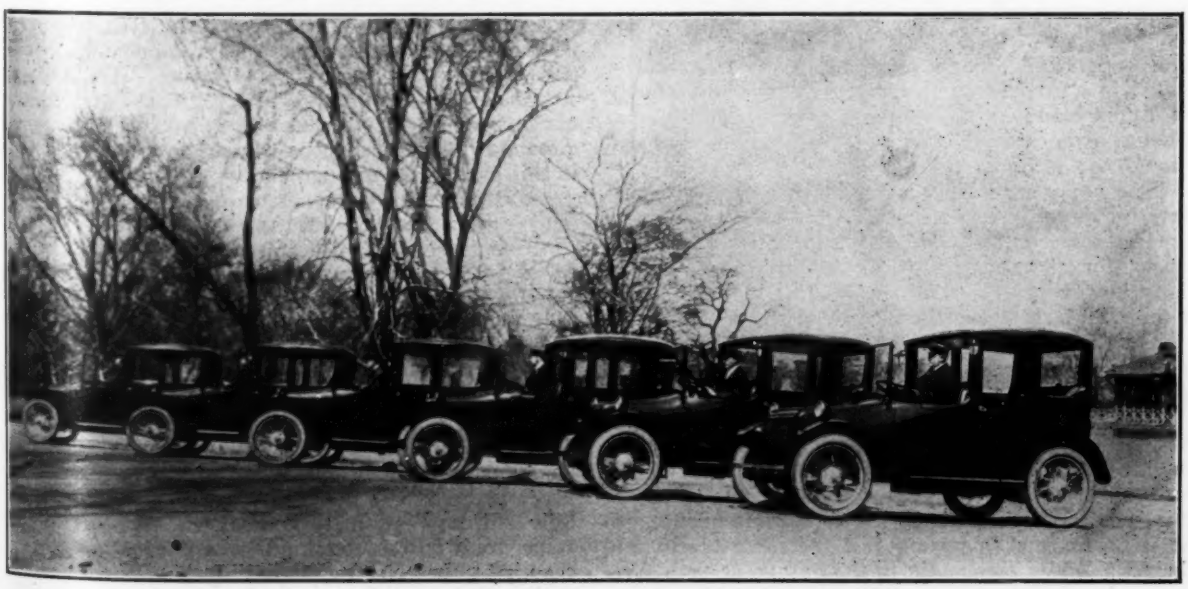
Electric taxicabs have been used successfully in several European cities for a number of years, in some of which preferential rates applied in the matters of licenses and taxes as it was realized that electric taxicabs, and their operation, possessed features of advantage to the municipalities. While several more proposed electric taxicab installations in Europe are pending, advices received the middle of June state, that owing to the scarcity of petrol (gasoline), a service of electric motorcabs (taxicabs) is about to be inaugurated at the Hague, Holland, and which may, by this time, be in operation.

In passing it will be of interest to note that in Detroit, the birthplace of the modern, successful electric taxicab, these electrical conveyances are operated during the day by women who discharge their duties very satisfactorily.

ELECTRIC TRUCK PERFORMANCE IN NEW YORK.

If the Couple Gear idea were new there wouldn't be so much to be said about the operating feats of this unusual type of electric truck. But when trucks with equipment from five to nine years old perform real stunts it becomes really noteworthy. For instance, in the motor truck equipment of the Clarence L. Smith Company, New York City, there are two 5-ton vehicles that frequently haul loads a third again over their rated capacity. Five years ago these two trucks were drawn by horses and in fair weather with loads not exceeding 4 tons each they managed to do about 20 miles a day. The horses have since been disposed of and "Couple Gear" equipment is doing the work and hauling the trucks sometimes as far as 35 miles a day, says the New York Edison Monthly.

Couple Gear equipment consists of two rather bulky looking wheels each of which contains a 3-horsepower motor. At each end of the motor armature there is a cog wheel which engages cogs set within the rim of the wheel. The motor receives its energy from a storage battery, and is controlled by a mechanism



Typical Electric Taxicabs, of Short Wheel-Base, Easily Controlled—"Made for City Manipulation."

very similar to a trolley control, mounted near the driver's seat. Quite frequently this equipment is mounted on vehicles designed originally for horse operation, thus converting a horse truck to an automobile.

In the case of the trucks already referred to, the wheels and battery were installed five years ago. At that time they were four years old, and now with a service record of nine years they are doing their work as efficiently as ever. And heavy work it is, too, for the Smith concern is engaged in the contracting business, a large part of which has to do with rock excavations. And a rock 8 feet long and 3 to 4 feet through is bound to make its presence felt on any truck. And that is the work these nine-year-old motors have been doing for the past five years.

They did something else, too—something the horses don't enthuse over. In a word they showed how much better the electric truck was than horses, and in the past five years there hasn't been a single horse purchased for the Smith establishment. On the other hand, several additional electrics have been installed.

Another old time truck in this establishment, one also engaged in heavy hauling, pulled a 20-ton load a

How Horse-Drawn Trucks Are Changed to Power Trucks. Bulk of the Weight Is Carried on the Steel-Tired Rear Wheels.

while ago. The truck itself weighs 6 tons and it pulled in a coal truck weighing 6 tons and carrying an 8-ton load—20 tons in all, and pulled by two 3-horsepower motors mounted within these unusual wheels.

The company is in the general contracting business. Part of its activities is the hauling of heavy material on contract and the supplying of electric trucks for all kinds of work. Its principal occupations, however, are in building contracting and in this it finds its largest use for electric trucks.

All the current for charging their electric trucks is supplied from the mains of the New York Edison Company.

The Smith Company not only handles its own contracting business, but acts as the New York representative of the Couple Gear Company and in this capacity operates the service station for the trucks of this type in New York City. As a consequence, reports on unusual operating feats of these trucks find their way quite frequently to the garage at 11th Avenue and 30th Street.

Not the least interesting of these is the record of the big vehicle used by the Clover Farms Dairy for hauling cans of milk from the New Jersey freight stations to the Harlem pasteurizing plant of the company. The trip covers a distance of 5½ miles and has been made in 27 minutes. The truck has been in service two years, it carries a 7-ton load, and since it must be ready for trips both day and night, is provided with extra batteries, with facilities for rapid transfer of the exhausted battery for the newly charged one.

A 7-ton platform truck used for grocery delivery has been giving excellent service for the past five years. Another 7-ton truck, used in the delivery of coal, was restored to service none the worse for its trip over the edge of a dock into the river.

During the past winter a fleet of the Smith trucks in New York, equipped with snow plows, did effective work in the removal of snow from the trolley tracks. In this they supplemented the regular trucks of the company.

Judging by the performances of these vehicles, it is apparent that they are admirably suited for heavy work. One of the reasons for this is found in the fact that while the vehicles are essentially automobiles, they retain the strength features of regular platform trucks. Particularly is this true of the rear wheels. These carry the bulk of the load and are tired with broad steel bands.

LONG DISTANCE TRAVELING VIA ELECTRIC VEHICLES.

A short time ago two ladies living in Utica, New York, drove an "electric" from that city to Albany, a distance of 95 miles, in one afternoon on one battery charge, using 200 ampere-hours. They spent the night in Albany during which the electric's batteries were charged. The following morning they left for Poughkeepsie, a distance of 77.5 miles, using 170 ampere-hours of current. While they were eating and resting at Poughkeepsie, a matter of three hours, the battery was "boosted"—electric current fed to the batteries at high pressure—leaving then for New York, a distance, with detour, of 80.9 miles, 200 ampere-hours being used. Over 253 miles were covered in a day and one-half of travel. The electric current used cost $2.50, or less than one cent per mile. Compare this with any gas car performance. And in doing so remember that this was not a "stunt" of a special car operated by a selected driver, but a trip made by a standard—and not new—car, driven by its owner,—in this case a woman.

A demonstrating car, as manufactured by a Cleveland concern, recently left Auburn, New York, at 9:30 p. m. and arrived at Elmira at 1:20 a. m., a distance of 78 miles on 172 ampere-hours. This route was via Seneca Falls, Lodi and Watkins and was about one-half over dirt roads and through very hilly country. Upon arriving at Elmira considerable current was left in the battery. The return trip was interesting—Elmira to Auburn via Watkins, Dundee, Pen Yan and Geneva. Because of a short demonstration in Pen Yan, the distance covered was 100.8 miles on one charge; the time, 6 hours, 19 minutes; current used, 220 ampere-hours. The roads for the most part, are hilly. From Watkins to Dundee is a very steep grade some four miles long, and, while this was covered readily by the "electric," many "gas" cars encountered and passed.

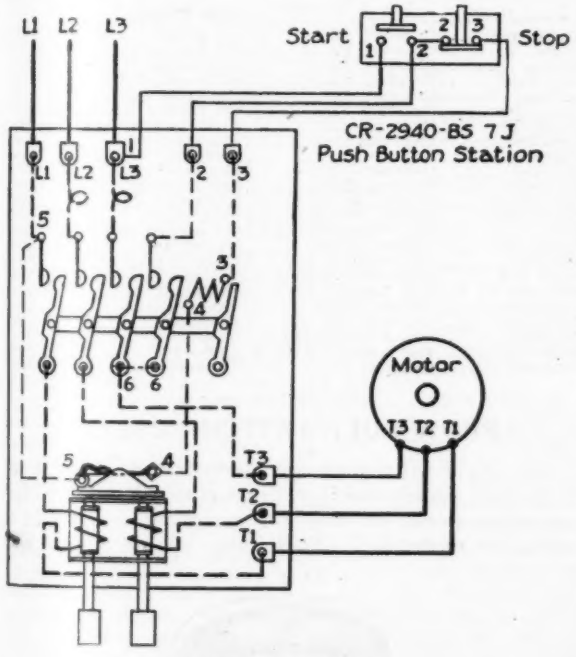
New Appliances

Remote-Control Switch—Beardslee Service Sticks—Westinhouse Marine Expansion—Arrow Pull-Switch Rosette

REMOTE-CONTROL STARTERS FOR SMALL SQUIRREL-CAGE INDUCTION MOTORS.

There has always been a demand for a device for starting small induction motors from remote points by throwing them directly across the line.

The General Electric Company has recently developed and placed upon the market such a starter, known as the CR-7006 remote-control switch, arranged for push-button control. This starter is applicable for use with motors up to and including 3 hp., 110 volts, and 7½ hp., 220, 440 and 550 volts. In addition to its starting function it provides protection against undervoltage and overload.

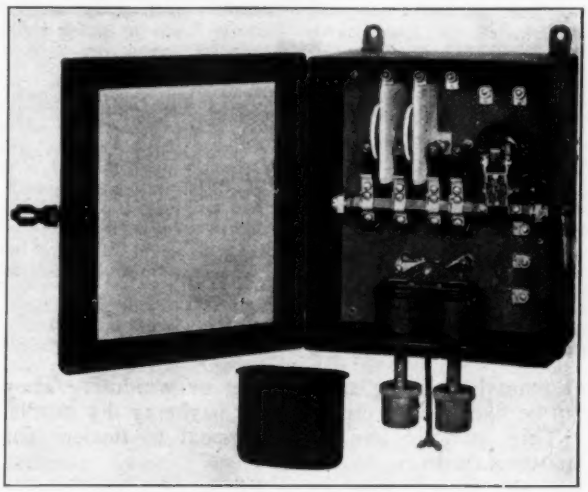


Front View of Panel
Connections for Remote-Control Switch.

The device consists of a 25-ampere, 3-pole contactor with two inverse-time-limit gravity-reset overload relays mounted on a slate base totally inclosed in a strong sheet-iron case.

A small "start and stop" push-button station is used as a remote-control switch. Completion of the starting circuit, by pressing the "start" button, energizes the coil of the magnetically operated switch, closing the contacts, which throw the motor directly on the line. Interruption of the circuit or a radical decrease in voltage permits the contacts to reopen by gravity, thus stopping the motor, which cannot start again until the "start" button is pressed.

The overload relays can be adjusted for various values ranging from normal up to 50 per cent above normal. They can also be adjusted over a wide range of time values. The relay trips automatically and resets by gravity.

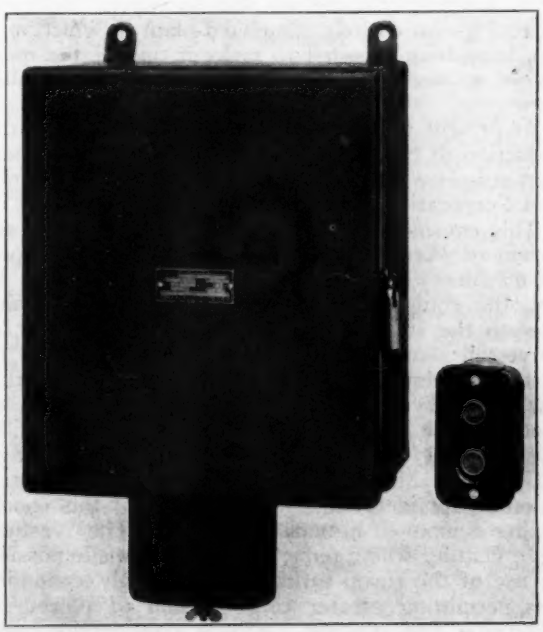


Starter With Cover Open.

The cover of the inclosing case is furnished with a hasp so that if desired it can be locked in a closed position by a padlock.

BEARDSLEE SERVICE STICKS.

The Beardslee Chandelier Manufacturing Company, 216 S. Jefferson street, Chicago, has gotten out a new patriotic line featuring "Beardslee's Service



Inclosed Remote-Control Starter.

Sticks." The line embraces five types of lamps made in candle style. They are serviceable while expressing "service."

These lamps are finished in white, with blue service star between stripes of true red; and are appropriate

One of Beardslee Service Sticks.

for mantel, dressing table, buffet or window. They may be had with electric bulb or bayberry dip candle.

This patriotic line should appeal to dealers for Christmas trade.

WESTINGHOUSE MARINE EXPANSION.

So imperative have become the demands for marine propelling equipments for the Emergency Fleet Corporation that recently the new Essington plant, South Philadelphia, of the Westinghouse Electric & Manufacturing Company has been placed in operation for the exclusive production of this equipment.

At present the Essington works occupies a comparatively small part of the 500-acre tract, which provides for ultimate expansion, and contemplates an increase of three to four times its present capacity. Seventeen months ago the Essington plant project was merely a carefully conceived plan on paper. Today it is a reality—an entirely completed plant in which millions have been invested to make it one of the most modern as well as the largest in the Philadelphia district.

At present the particular work at Essington is the production of complete propelling equipment for merchant vessels which are being built for the Emergency Fleet Corporation.

This enormous plant, devoted entirely to the production of Westinghouse geared-turbine ship-propelling machinery, is sufficient for 15 average vessels. In fact, the equipment embraces practically everything between the steam boiler plant and the propeller of the vessel.

The development of the Westinghouse reduction gear, begun by George Westinghouse in 1909 and his associates, the late Rear Admiral George W. Melville, formerly chief engineer of the United States Navy, and John H. MacAlpine, a marine engineer of international experience, was the beginning of this epoch-making equipment in maritime circles. The Westinghouse floating frame reduction gear has made possible the use of the steam turbine with its high economies, thus permitting greater concentration of power for propulsion and making available considerable more cargo space.

The difficulties in the design of a reduction gear for transmitting high powers at high speeds have been entirely overcome as a result of the scientific work of the late Mr. Westinghouse and his associates.

Because of this the Westinghouse gear with its flexible frame is as reliable in operation as the Westinghouse air brake with the triple valve.

At the Essington plant there are 350 complete marine-propulsion equipments on order or under construction. The significance of these orders can better be appreciated when it is considered that they include steam turbines, reduction gears, condensers, condenser pumps, small turbine generator equipment for lighting, stern tubes, propeller shafting, propeller shaft bearings.

The largest equipment is 12,000 shaft horsepower and none of the sets are less than 1500 shaft horsepower.

Of the ships ordered prior to January 1, 1917, 21 are now in service, and their highly credible performance has proved the reliability and economy of geared turbine propulsion machinery.

The steam-turbine driven oil tankers, freight and passenger ships completed to date, most of which are now actively engaged in trans-Atlantic service, are listed below:

Name of ship.	Built at.	Type of ship.	Shaft hp.
Malmanger	Chester, Pa.	Oil tanker	2900
Golaa	Chester, Pa.	Oil tanker	2900
Hisko	Chester, Pa.	Oil tanker	2900
Avondale	Chester, Pa.	Oil tanker	2900
Sudbury	Chester, Pa.	Freighter	2300
Overbrook	Chester, Pa.	Oil tanker	2900
Coronado	Oakland, Cal.	Freighter	2400
Yosemite	Oakland, Cal.	Freighter	2400
Yellowstone	Oakland, Cal.	Freighter	2400
Oakland	Oakland, Cal.	Freighter	2900
Westerly	Seattle, Wash.	Freighter	2300
Westwood	Seattle, Wash.	Freighter	2500
West Eagle	Seattle, Wash.	Freighter	2500
Maui	San Francisco, Cal.	Passenger & freight	12500
West Ford	Seattle, Wash.	Freighter	2750
Accomac	Los Angeles, Cal.	Freighter	2000
Polar Sea	Baltimore, Md.	Freighter	1800
Wakulla	Los Angeles, Cal.	Freighter	2000
Montrolite	Seattle, Wash.	Tanker	2500
Wampum	Los Angeles, Cal.	Freighter	2000
Wassiac	Los Angeles, Cal.	Freighter	2000
West Galoc	Los Angeles, Cal.	Freighter	2000
Phoenix	Chester, Pa.	Tanker	2900

ARROW PULL-SWITCH ROSETTE.

Specifications for modern industrial housing show a decided preference for brass-covered devices, for concealed work, suitable for attaching directly to a ceiling or outlet box. Such units are decorative and

Pull-Switch Rosette with Brass Cover.

economical, as they can take the place of a more or less elaborate fixture.

Keyless receptacles, pull receptacles and plain rosettes, with brass covers, have been standard for some time, but the Arrow Electric Company, Hartford, Conn., is offering a new device, the pull-switch rosette, to complete the line. It is compact and strong, the cover being firmly attached by screws. It is designed for loop wiring, and the porcelain is recessed to take a fixture loop. Each rosette is equipped with a long cord.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

FARMINGTON, ME. — Franklin Power Company is planning for the construction of a hydroelectric power plant about 25x45 feet, with extension 25x35 feet, for turbine wheel, near North Monmouth.

WATERVILLE, ME. — Lockwood Company is having plans prepared for the erection of a hydroelectric power plant. Bids for construction, including flume work, will be called in about 30 days. I. W. Jones, Milton, N. H., is engineer for the company.

CENTRAL FALLS, R. I.—Bryan-Marsh Electric Works of the General Electric Company will make improvements and extensions in its plant on Mill street, including the erection of a one-story addition to its engine plant.

HAZARDVILLE, CONN.—Howard D. and William W. Gordon, operating a factory in the Enfield District, have had plans prepared for a hydroelectric power plant for works operation to cost about $12,000.

BUFFALO, N. Y.—The City Council is arranging a new street-lighting contract with the Buffalo General Electric Company at a rate to be operative until the close of the war. The contract will expire July 1, 1921, or before should the war come to a close.

BUFFALO, N. Y.—Miscellaneous contracts have been awarded by the National Electric Lamp Works of the General Electric Company for the new power plant and lamp works to be located on Fillmore avenue at a cost of about $200,000, insuring the early completion of the structure. The plant will be three-story, about 80x280 feet.

BUFFALO, N. Y.—Pierce Arrow Motor Company has taken out a permit to build a new two-story, brick and steel boiler plant on Elmwood avenue to cost about $60,000. The company will also build two new one-story testing buildings, about 100x250 feet, and 30x300 feet, respectively.

FORT TERRY, N. Y.—The Ordnance Department, Washington, D. C., is having plans prepared for the construction of two power plants and laundry buildings at Fort Terry and Fort Wright, to cost about $300,000 each. General R. C. Marshall is in charge; Colonel F. M. Gunby, advisory engineer, both located at Washington.

NEW YORK, N. Y.—Connecticut Electric Steel Company, 50 Church street, has increased its capital from $105,000 to $157,500 for extensions.

NEW YORK, N. Y.—Marconi Wireless Company has entered into agreement with the Chinese Government for furnishing wireless telephones with forty-mile range equipment at a cost of $300,000. The apparatus is to be delivered within nine months.

ROCKAWAY, L. I., N. Y.—The Bureau of Yards & Docks, Washington, D. C., C. W. Parks, chief, is taking bids for a new hydro cylinder house at the local Government station to cost about $40,000.

SYRACUSE, N. Y.—To provide for increased service from the works of the Semet-Solvay Company, Split Rock plant, near Solvay, the Auburn & Syracuse Electric Railway Company has purchased a 350-ton electric locomotive, Westinghouse type, the first of its kind to be used by the company. The locomotive will be used on the freight line extending to Marcellus.

BLOOMFIELD, N. J.—General Electric Company, Schenectady, N. Y., is having preliminary plans prepared for a boiler plant to be erected at its local Sprague Electric Works.

DOVER, N. J.—The Board of Water Commissioners is considering the installation of new electric pumping machinery at the municipal waterworks to increase the capacity of the plant.

HARRISON, N. J.—Electric machinery and equipment will be installed in the new group of buildings to be erected by the Crucible Steel Company of America at its local plant on South Fourth street. The new steel plant unit is estimated to cost about $86,000. W. H. and F. W. Cane, Woolworth building, New York, have the contract for construction.

NEWARK, N. J.—Electric operating equipment will be installed in the new briquet manufacturing plant to be erected by the Burnrite Briquet Company, Singer building, New York, at Alpine street and Avenue A. The plant will comprise a group of buildings to cost over $10,000.

DIXMONT, PA.—The trustees of the Dixmont Hospital for the Insane have broken ground for the construction of a one and one-half story electric power plant at the institution. D. T. Riffle, Keenan building, Pittsburgh, has the contract for erection.

HARRISBURG, PA. — Harrisburg Light & Power Company is now operating its plant on Cedar street at capacity following improvements in the boiler department. Considerable trouble has been experienced recently in the failure of brick arches for the stoker installation, causing interruption in service. The company has filed notice of increase in rates for service for electric signs, with arrangement for refund of payment when made at certain rates for stated periods and service cannot be rendered owing to shortage of fuel. C. M. Kaltwasser is general manager.

PHILADELPHIA, PA.—The Water Bureau is planning for the purchase of new stokers for the boiler plants of the department at Lardner's Point.

PHILADELPHIA, PA.—Plans have been completed by the Philadelphia Electric Company for its one-story electric power plant at Palmer and Beach streets to cost $10,000,000, and Government approval asked to authorize construction. Stone & Webster, 147 Milk street, Boston, Mass., are engineers.

PHILADELPHIA, PA.—The Bureau of Yards & Docks, Washington, D. C., is planning for the construction of a new radial brick stack at the League Island Navy Yards to cost about $10,000.

PHILADELPHIA, PA.—The Emergency Fleet Corporation is considering the construction of a new steam-driven electric generating station at the Hog Island shipbuilding works, for plant operation.

PITTSBURGH, PA.—South Pittsburgh Water Company has commenced the installation of new boilers and boiler equipment at its plant for increased pumping service for the Munhall, Homeville and Whitaker districts.

PITTSBURGH, PA.—Westinghouse Electric & Manufacturing Company, East Pittsburgh, has broken ground for the construction of a four-story and basement addition to its plant, about 34x96 feet, to cost about $50,000. It is understood that the structure will be used for office service.

PITTSBURGH, PA.—To provide additional power for the industrial works in this section working on war contracts, the Fuel Administration has issued an order covering the discontinuance of electric service to commercial business concerns and residences between the hours of 7:30 and 10 a. m. It is estimated that the saving thus effected will aggregate about 9,000 kilowatts, materially assisting the estimated 10,000 kilowatts shortage now needed at the different munition plants. The order covers the operation of elevators and all items in connection with the consumption of electric energy for commercial service.

YORK HAVEN, PA.—York Haven Power Company is pushing work to insure the early completion of the new dam on the Susquehanna river, near Falmouth, for its hydroelectric power station in this district. By this means it is expected to maintain full generation at low water periods, which has heretofore caused interference in operation.

BALTIMORE, MD. — The power plant addition to be erected by the Consolidated Gas, Electric Light & Power Company at its Westport generating station will be one-story, brick and reinforced concrete, costing for power house proper about $500,000. E. D. Edmondson is engineer.

WASHINGTON, D. C.—The Bureau of Yards & Docks, Navy Department,

has awarded a contract to Johansen & Kierman, Norfolk, Va., for the construction of a new power plant at St. Julians, Va., to cost, exclusive of equipment, about $13,000.

NORFOLK, VA.—C. W. Parks, chief of bureau, Yards and Docks, Navy Department, will receive bids for electric light and power system for the U. S. Government.

YORKTOWN, VA.—The Government is taking bids for the construction of a new oil plant on a local site. The works will include boiler plant, heater houses, electrical and mechanical machinery and equipment, etc.

CHARLESTON, W. VA.—Kanawha Collieries Company, National Bank building, recently organized, is planning for the installation of electrical machinery and equipment at its coal mining properties. William G. Conley is president.

MORGANTOWN, W. VA.—New electric motors and other electrical equipment will be installed by the Mt. Morris Coal Company, Mt. Morris, Pa., recently organized, at its local coal properties. J. J. Long is secretary of the company.

BELHAVEN, N. C.—The City Council has approved a bond issue of $25,000 for the installation of an electric-lighting system.

WILMINGTON, N. C.—Tidewater Power Company, operating the Consolidated Railways, Light & Power Company, is planning to increase the capacity of its power plant. It is said that the present output will be doubled. A. B. Skelding is general manager.

CAMP JACKSON, S. C.—A power plant and laundry will be established by the War Department at the cost of $150,000.

CAMP SEVIER, S. C.—The War Department will establish a power plant and laundry at the cost of $150,000.

CAMP GORDON, GA.—The War Department will establish power plant and laundry at cost of $180,000.

WAVERLY HALL, GA.—I. H. Pitts & Son Company are in the market for electric lighting machinery.

NORTH CENTRAL STATES.

CLYDE, OHIO.—The plant of the Sholder-Excell Manufacturing Company, manufacturer of electrical supplies, was destroyed by fire recently. Sparks from a railroad engine ignited the building.

NORWALK, OHIO.—$25,000 in bonds will be issued for the purchase of a 500-kilowatt generator for the municipal power plant. Address W. G. Mack, city manager.

FORT WAYNE, IND.—Fort Wayne & Northern Indiana Traction Company has filed a petition with the Indiana Public Service Commission asking for permission to charge a straight fare of six cents in Fort Wayne and three cents a mile on interurban lines. Robert M. Fuustel, president of the company, has announced that if the increase is granted, that the wages of the company's employees will be raised. A straight five cent fare and a skip-stop system went into effect in Fort Wayne recently.

DATES AHEAD.

Michigan Section, N. E. L. A. Annual convention, Pantlind Hotel, Grand Rapids, Mich., September 17 and 18. Secretary-treasurer, Herbert Silvester, Monroe, Mich.

International Association of Municipal Electricians. Annual convention, Atlanta, Ga., September 24-27. Clarence R. George, Houston, Tex.

New England Section of the National Electric Light Association, Annual meeting, Hotel Kimball, Springfield, Mass., September 27 and 28. Secretary, Miss O. A. Bursiel, Boston, Mass.

American Electrochemical Society. Fall meeting, Princeton, N. J. Secretary, Prof. J. W. Richards, Lehigh University, Bethlehem, Pa.

American Electric Railway Association. Annual meeting, Atlantic City, N. J., October 8 and 9. Secretary, E. B. Burritt, 8 West 40th street, New York City.

Illuminating Engineering Society. Annual convention, New York City, October 10. General secretary, Clarence L. Law, Irving place and 15th street, New York, N. Y.

Jovian Order. Annual convention, Dallas, Texas, October 24-25-26. Mercury, Ell C. Bennett, 1415 Syndicate Trust building, St. Louis, Mo.

Kansas Public Service Association. Annual meeting, Kansas City, Kans., October 17-19. Secretary-treasurer, W. W. Austin, Cottonwood Falls.

BRADFORD, ILL.—An election was held September 12 to decide the question of issuing $10,000 electric light bonds. Address J. R. Blaisdell, village clerk.

CHAMPAIGN, ILL.—After three days of striking the conductors and motormen of the Urbana & Champaign Railway, Gas & Electric Company returned to work under a temporary agreement specifying that the demands of the men will be carefully considered by the company. The men demanded a wage of 48 cents an hour, with a closed shop agreement and the submission of all cases of discharged men to a board for consideration.

DECATUR, ILL.—Trainmen on the Illinois Traction System have announced that they have petitioned the railroad wage board in Washington for a hearing on their petition for higher wages. Although the Illinois Traction System is not under federal jurisdiction, the men believe that their petition will be granted owing to the increase allowed street railway trainmen in various cities throughout the country.

ELGIN, ILL.—Elgin & Belvidere Electric Railway Company has filed a petition with the Illinois Public Utilities Commission asking for an increase of 25 per cent in freight rates and an increase in express rates to conform with those now charged by the Government controlled express companies.

LINCOLN, ILL.—Municipal ownership of the street railway system here has proven a success. During the chautauqua season totaled $1,440, average of $103 a day, compared to $85 last year when the railway was under private ownership. A five cent fare instead of ten cents has been charged and 22,400 passengers were handled during the chautauqua period.

MARION, ILL.—The motormen and conductors of the Coal Belt Electric Railway Company have returned to work. The company had offered 47½ cents an hour and the men demanded 50 cents an hour. Hugh Willis, of the State Council of Defense, intervened and secured the service of state officials. The company met the demands of the men and agreed to a wage basis of 50 cents an hour. There was no interruption to service.

QUINCY, ILL.—Skip-stops will be instituted by the Quincy Railway Company. As a further means of conserving coal the company will not use coal for the generating of power between 10 a. m. and 5 p. m., but has made arrangements for Keokuk power during those hours. The company in 1917 used 8000 tons of coal. The use of the Keokuk power in the specified hours and the skip-stop plan will cause a reduction of 20 per cent in the use of coal or about 1600 tons.

DETROIT, MICH.—Solvay Process Company will erect a $35,000 power plant at 1501 W. Jefferson avenue.

COUNCIL BLUFFS, IOWA.—The Chicago, Rock Island & Pacific Railway Company will build a power plant. Address C. W. Jones, manager, Des Moines, Ia.

FORT MADISON, IOWA.—The Atchison, Topeka & Santa Fe Railroad Company has completed plans for the construction of a new one-story power plant, 100 feet by 100 feet, Shopton, Ill., near this city. This company will also erect extensive new freight and passenger facilities at Tulsa, Okla. Right-of-way has been secured for 60 miles of new tracks between Carrollton, Mo., and Moberly, Mo., the construction of which will provide the Chicago, Burlington & Quincy and the Santa Fe a joint low grade line between St. Louis and Kansas City.

HUMBOLDT, IOWA.—A franchise has been granted to the Northern Iowa Gas & Electric Company to build 6 miles of transmission lines. Address A. S. Harrington, manager.

MAQUOKETA, IOWA.—An election will be held September 24 to vote on the question of issuing $65,000 municipal light and power bonds. Address W. C. Morden, mayor.

PALMER, IOWA.—$7,000 in bonds have been voted to build transmission lines. Address village clerk.

WASHOTT, IOWA.—Farmers' Electric Line Company has been granted a franchise to build a transmission line. Address Albert Blank.

HARRISONVILLE, MO.—Election held recently to vote on the proposition of leasing the municipal electric light plant to the Green Light & Power Company of Pleasant Hill, Mo., for a period of ten years was carried.

KANSAS CITY, MO.—The steel needed for the new power plant at the foot of Brooklyn avenue can be secured and some is already on the ground, according to Joseph F. Potter, president of the Kansas City Light & Power Company. This means that the new plant should be in operation by March or April of 1919.

LIBERTY, MO.—A storm August 29 destroyed the 60 ft. smoke stack of the municipal light plant and for several

days afterward Liberty was without light or water.

MILAN, MO.—The electric light plant at Milan has been destroyed by fire. Address village clerk.

ABILENE, KANS.—An election will be held September 17 to vote whether the city of Abilene shall renew its franchise with the Riverside Light, Power & Gas Company.

CHANUTE, KANS.—Additions will be made to the electric light plant.

DOWNS, KANS.—Solomon Valley Light & Power Company is endeavoring to reach an agreement with the cities of Downs, Glen Elder, Cawker City, Gaylord, Portis, and Kirwin whereby they will agree to raise $7,000 to put the plant in shape for business.

FREDONIA, KANS.—A petition has been presented to the council urging the installation of a municipal light plant.

PROTECTION, KANS.—Arkansas Valley Telephone Company has been purchased by the Southwestern Bell Telephone Company.

WAMEGO, KANS.—An ordinance has been passed authorizing the Riverside Light, Power & Gas Company of Abilene to erect a transmission line through the west city limits to the Wamego light and water plant, and from there to the Young Alfalfa and Lord flouring mills. The ordinance also provides for the erection of a transformer station and the furnishing of current to the light and water plant and factories.

FARGO, N. D.—The State of North Dakota will erect an electric power plant at the state university. Address Rose & Harris, Auditorium Building.

SOUTH CENTRAL STATES.

BREWTON, ALA.—Blacksher Electric Line Corporation has been organized to build an electric line from Brewton to Alex. Address E. M. Blacksher, incorporator.

FORT PAYNE, ALA.—$14,000 municipal light bonds have been authorized. Thomas Sawyer, mayor.

NEWPORT, ARK.—Arkansas Light & Power Company of Arkadelphia contemplates the construction of an electric transmission system to furnish electricity to Newport and Tuckerman.

BRISTOW, OKLA.—A white way and electric light system for the residence districts will be installed by the local electric light company very shortly.

ROFF, OKLA.—The poles, wires and fixtures of the municipal light plant will be sold to the Oklahoma Power & Transmission Company for the sum of $6,500. The transaction also includes a franchise.

BROWNSVILLE, TEX. — Bonds have been voted to extend the electric light system. Address mayor.

ORANGE, TEX. — National Shipbuilding Company will install an independent electric light plant at its shipyards.

WESTERN STATES.

FARMINGTON, N. MEX.—Olin C. Walker has bought the controlling interest in the local light and power plant.

BAY POINT, CAL.—Bay Point Light & Power Company will expend $24,000 for extensions and equipments. Address general manager.

PORTERVILLE, CAL.—In view of the practical certainty of an early raise in the price of electrical energy, an added impetus has been given to plans already under consideration for a municipal light and power plant. Instructions have been given by the city council to F. W. Pease, city engineer, for a detailed estimate of the cost of installation of a distribution system and generating plant.

SAN DIEGO, CAL.—San Diego Gas & Electric Company will expend $226,400 in new construction in its gas department and $214,000 in its electric department. Address general manager.

INCORPORATIONS

MANCHESTER, IOWA.—Articles of incorporation have been signed by a number of Manchester business men forming the Delaware County Light & Power Company. The capital stock of $25,000 has been fully subscribed and business is authorized to begin when $13,500 of this amount is paid in. The officers of the company are Joseph Hutchinson, president; William Hockaday, vice-president; Harry Seeds, secretary-treasurer; A. M. Cloud, F. E. Richardson, E. M. Carr and J. C. Nieman, directors.

NORFOLK, VA. — Burton-Poore Electric Company, Inc., has incorporated to conduct a general electric supply business. The maximum capital is placed at $5000 and the minimum at $500. J. M. Burton is president of the company and E. S. Poore, secretary-treasurer.

DOVER, DEL.—International Western Electric Company, Inc., has incorporated to manufacture electrical instruments and machinery. The capital stock of the company is given as $20,000,000.

PHILADELPHIA, PA.—The Storage Battery & Appliance Corporation. Capital, $150,000. To engage in the manufacture of storage batteries and appliances. Incorporators: William Knoblock, D. G. Scott, and William J. Graham, Philadelphia.

DOVER, DEL.—Electropure Process Company. Capital, $100,000. To engage in the purification of liquids by electricity. Incorporators: F. D. Buck, M. L. Horty, and K. E. Longfield, Wilmington.

COLLINGSWOOD, N. J.—Water Cooled Culm Burning Grate Company. Capital, $75,000. To manufacture grates. Incorporators: L. Morris, J. E. Cattell, and S. J. Scott, Collingswood.

SAVANNAH, GA.—Chatham County Traction Company has been incorporated with a capital of $150,000. The company will build an electric line to connect with the Savannah Electric Company's line to Port Wentworth. Address H. C. Foss.

MANCHESTER, IOWA. — Articles of incorporation have been signed for the Delaware County Light & Power Company. The company has purchased the Quaker Mill property, two miles from Manchester, and plans to utilize the power developed for light and power. Capital stock $25,000. Joseph Hutchinson, president.

SYRACUSE, N. Y.—Iroquois Utilities, Inc. Capital, $165,000. Formed by a consolidation of the Randolph Light & Power Company, and the Gowanda Light & Power Corporation. Incorporators: A. M. Ellis, B. H. Shepard, and L. S. Chapman, Syracuse.

CLARKSBURG, W. VA. — Home Electrical Company. Capital, $10,000. To manufacture electrical supplies. Incorporators: A. Hattenbach, H. F. Gates and W. S. Waters, Pittsburgh, Pa.

PLAINFIELD, N. J.—Accurate Engineering Company. Capital, $35,000. To act in a general electrical and mechanical engineering capacity. Incorporators: Charles P. Crouch, Anton Johanson and G. W. V. Moy.

DOVER, DEL.—International Western Electric Company. Capital, $20,000,000. To manufacture electrical instruments and machinery. Incorporators: William F. O'Keefe, E. E. Abarle and J. H. Dowdell, Wilmington.

TOLEDO, OHIO.—Liberty Equipment Company was recently incorporated with a capital of $100,000, to operate tractor trains between Toledo and Detroit. Frank C. Smith and Frank L. Baird are the incorporators.

INDIANAPOLIS, IND. — Ahlgren Light & Storage Battery Company has incorporated with a capital of $25,000 to manufacture, buy and sell electric lighting systems. The directors are H. C. Austill and others.

NEW PUBLICATIONS

PROCEEDINGS WISCONSIN ELECTRICAL ASSOCIATION—The proceedings of the tenth annual convention of the Wisconsin Electrical Association are ready for distribution. The volume comprises 135 pages and includes all papers, reports and discussions presented before the convention in Milwaukee last March. A list of the members of the Association is included.

SPECTRO-RADIO METRIC INVESTIGATION OF THE TRANSMISSION OF VARIOUS SUBSTANCES.—This paper known as Scientific Paper No. 325, of the Bureau of Standards, Washington, D. C., gives the spectral transmission of various substances, especially colored fluorite and colored glasses. In some scientific investigations it is desired to expose large areas to radiant energy stimuli of a fairly high spectral purity. Some of the substances described in this paper provide a simple means of obtaining narrow spectral bands of energy of high intensity, and large areas without employing a spectroscope. The data on glasses are useful in connection with the question of protecting the eyes from injurious radiations. This publication is now ready for distribution and those interested may obtain a copy by addressing Bureau.

Trade Activities

Westinghouse Turbogenerator Used for Ship Lighting—Haller Consolidated Electric Sign Engages New Quarters

Haller Consolidated Electric Sign Company has moved into its new location at 113 N. Desplaines street, Chicago, which provides several thousand square feet of floor space. The building consists of three floors and a basement, so when the electric sign business gets back to normal the company will have facilities for a large output.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been awarded contracts for three 15,000-k.w. generators for a generating plant, which will cost approximately $5,000,000 to erect, and will be used in connection with the Government ordnance plant now being built in Neville Island. The contracts were awarded by the United States Steel Corporation, which acted for the United States Government.

Bates Expanded Steel Truss Company, Chicago, Ill., is distributing an attractive paper weight embellished with a view of a Bates steel pole in combination service. A limited number of these serviceable souvenirs is available and will be sent upon request. The Bates company is the sole manufacturer of one-piece steel poles for transmission, telephone, telegraph and trolley service and reports rapidly increasing demands. About 2,000 tons of steel are kept on hand to insure quick deliveries. In the Steel-Pole Treatise, published by the company, full particulars are given regarding advantages, construction, prices, etc.

Adaptability of 10-Kilowatt Turbogenerator for Ship Lighting.—In the equipment of steel and wooden ships, built and under construction in the several shipyards at Portland, Oregon, and other Pacific Coast centers, the Westinghouse 10-kw. direct-current turbine-generator has met with ready demand for ship lighting, fan motors and wireless apparatus. Generator sets of this type were installed as follows: Eight sets on four steel ships built at Columbia River yards; sixteen for ships at Northwest Steel Works, on Willamette River; ten on ships in Standifer Construction Company yards at Vancouver, Wash., and eight on steel ships in Supple-Ballen Company yards on the Willamette. These units are especially built for reliability and continuity of operation, requiring the minimum of attention. They constitute one of the company's newer developments along this line, not only to meet the demands for ship lighting, wireless and other service on ships, but for such industrial plants as oil refineries, steam-shovel lighting, and to supply electric current at 250 volts for locomotive-crane magnets, used in steel mills and railroad yards. They are designed for 10 kilowatts, although a temporary load of 12½ kilowatts may be obtained. They have been found of special utility in open-cut mining where flood lighting at night is required. The fact that such a unit must often work under severe conditions, made it necessary that it be both substantially and simply constructed. It is of the one revolving element, in which the generator shaft is so extended that it also carries the turbine rotor, thus eliminating all coupling, avoiding all misalignment troubles, and dispensing with turbine bearings. The turbine rotor, made of open-hearth steel forging, is accurately finished. Electro-furnace steel blades placed in the periphery are held in position by pins through blades and rotor. The one row of blades are of the impulse type, and by means of a reversing chamber the same steam is turned through the blades a second time, allowing complete expansion.

Reynolds Electric Company, 422-428 South Talman avenue, Chicago, manufacturer of the "Reco" line of products, is sending out in illustrated folder, which embraces a number of lighting suggestions and points out how the judicious use of light acts as a safeguard to property. This circular features Reco reflectors, suitable for lighting munition plants, trenches, yards, subways, interiors and exteriors wherever concentrated lighting is required. They are made of steel, porcelain enameled, decagon in shape and take 100-watt Mazda type B or C lamps. The Reco reflector is impervious to any weather conditions and is claimed to give perfect distribution of light. It is furnished with or without pipe and is easily installed and maintained.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., is distributing a new 4-page standard descriptive booklet known as Booklet F, and dealing with C-H iron-clad solenoids. These iron-clad solenoids are particularly adapted for operating brakes used in connection with crane, elevator, and hoist motors. The Cutler-Hammer Company has very successfully applied these solenoids to band brakes used in connection with its magnetic clutches on rubber mill and similar heavy duty drives. The booklet describes the construction of these solenoids and points out such advantageous features as: the floating plug which gives the solenoid a high sealing pull without objectionable hammer blow; the connecting rod for attachment to the load to be lifted which eliminates the necessity of accurate alignment; and the absence of excessive side pull on the plunger due to the patented equalizer bushing. The solenoids are made with shunt and series windings, shunt winding having a protective switch to prevent overheating the coil. The booklet lists the four sizes and gives the stroke, gross pull, dimensions, weights, and other interesting data.

The A. C. Mannweiler Company, Inc., Fort Wayne, Ind., has just distributed a number of circulars descriptive of its well-known line of miniature lamps and automobile bulbs. In all cases a price list is included and brief descriptions of each item given. One of the most unique developments of the company along this line is a lamp made up into a cross to be used in connection with the ordinary Christmas tree bulbs. It is made in an assortment of colors and can be burned in series with any of the standard tree bulbs on the market.

Wheeler Condenser & Engineering Company, Carteret, N. J., has just published Bulletin 112-A entitled "Condensers, Pumps, Cooling Towers, Etc." Readers contemplating the installation of a condenser will be interested in a discussion in this bulletin entitled "Choice of Kind of Condenser" and in the remainder of the bulletin which illustrates and describes other Wheeler condensing machinery in detail. The bulletin embraces large and small surface condensers, showing typical complete installations; rectangular and cylindrical types; jet condensers, barometric condensers; Wheeler Edwards air pumps; Wheeler rotative dry vacuum pumps; the Wheeler turbo air pump; centrifugal pumps for circulating water; natural and forced draft cooling towers. In addition, a page is devoted to the Wheeler feed water heater and two pages to Wheeler multiple effect evaporators and dryers.

E. C. Atkins & Company, Indianapolis, Ind., manufacturers of silver steel saws, have ready for distribution their latest catalog, descriptive of Atkins Kwik-Kut metal cutting machines. It is profusely illustrated and deals at some length with the requirements of reciprocating machines and in this connection directs attention to the great efficiency and economy of the Atkins machine tool. The booklet describes in detail the various parts of the machine and designates the improvements that are of particular interest. Among features claimed for the Kwik-Kut metal cutting machine are its raising device, saw guide, lubricating system, automatic stop, individual motor drive, etc., which with increased cutting capacity makes the Kwik-Kut machine one of the most desirable hack saw machines on the market. They are used in many large operations throughout the United States, Canada, South America, Europe, Australia and Great Britain and the large list of users bear testimony to the perfect satisfaction given by this machine. The Atkins Company has also prepared a booklet on circular saws for cutting metals which contains considerable information regarding this product; also a hack saw chart and price list covering Atkins "AAA" hack saw blades.

Recent Patents

Selected and Summarized by Albert Scheible, Patent Attorney, 79 West Monroe Street, Chicago, Illinois

A series of brief comments on some of the recently issued electrical patents which appear to be of particular interest to our readers, the number after each heading being that of the United States patent to which the summary relates. Any correspondence regarding such patent matters should be sent direct to Mr. Scheible at the above address.

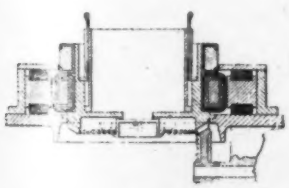
Electric Welding (1,273,203). —For obtaining a practically steady pressure in spot welding, Elihu Thomson uses a freely movable electrode, an anvil adapted to receive blows from a hammer, and an elastic medium disposed between the anvil and the hammer. (Patent assigned to the Thomson Spot Welder Co. of Boston.)

Cue-Chalking Machine (1,273,219). —Instead of chalking billiard cues by hand, James H. Hall (of Lexington, Mo.) rotates the chalk by means of an electric motor opposite a guide for the cue, and uses the air blast of the motor to expel the chalk dust from the machine.

Connecting Train Telephone Lines (1,273,246).—In connecting one car to another, Gustaf W. Lundin (of Bellevue, Iowa), joins the telephone lines by means of a coupling which includes arrow-shaped terminals interlocking with each other.

Insulator (1,273,313).—Instead of depending merely on the fastening screw for clamping the two parts of a split porcelain knob on a wire, Thomas W. Beatty (of Carey, Ohio), also uses a spring clip which snaps the parts together.

Knitting Machine (1,273,802).—A novel direct drive arrangement, which would also seem to be adapted for use with all classes of motor driven appliances is shown in this patent to



No. 1,273,802.—Knitting Machine.

Herrik Aiken, of Franklin, N. H. He mounts the rotor of a motor directly on a rotary element of a knitting machine and gears this same element to a shaft for driving other parts of the machine.

Illuminated Water Gage (1,273,413). —To make the level of water in a glass gage more easily visible, Gothard Sargl (of East Grand Forks, Minn.), concentrates rays of light on it from points below the gage and at opposite sides of the gage, so that the light is refracted from the top of the column of liquid.

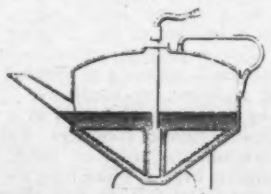
Dry Secondary Cell (1,273,447).—A battery of the "voltaic pile" type, with the active elements composed alternately of cone-shaped electrodes and of similarly shaped separators, the latter being made of acid absorbing but acid resisting material. Patented by Julius Becker of Chicago.

Electrical Heater (1,273,666).—To heat a pipe, Charles C. Powers (of Williams, Ariz.), puts a strap around the pipe and winds a heating coil in the two ends of the strap, which project like a fin, so that this coil also clamps the strap in position.

Circuit Breaker (1,273,786).—An automatically reclosing circuit breaker is described in this patent, assigned by Estell C. Raney to the Automatic Reclosing Circuit Breaker Co., of Columbus, Ohio. The reclosing mechanism is normally held out of action by a detent which can be released electrically, and the circuit for effecting this release is shunted by a circuit which is open when the controller is in its "off" position.

Wireless Signaling (1,273,789).—Instead of depending on intermittent current impulses, William C. White (of Schenectady, N. Y.) produces electrical waves continuously in an antenna by means of an electron discharge device comprising a cathode, an anode, and a controlling grid. Then he varies the amplitude of the waves by diverting a variable amount of energy from the grid circuit of the electron discharge device in accordance with the signals which are to be transmitted.

Cooking Vessel (1,273,821).—More effective circulation of the liquid, and consequently more rapid heating, is claimed for the cooking vessel of Howard C. Causton (Vancouver, B. C.). He builds his kettle or the like with a substantially conical bottom and mounts an inner hollow ring within this bottom, leaving a central vertical tube somewhat larger in diameter than the removable heating unit, so that the action of this unit is concentrated on a relatively small part of the liquid.

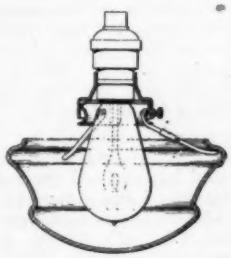


No. 1,273,821.—Cooking Vessel.

Electric Counter (1,273,820).—A magnetically actuated counter. Patent assigned by Clarence N. Cahusac to Slocus, Avram & Slocum, of New York.

Brush Holder (1,273,870).—A novel commutator brush holder is disclosed as one feature of a patent on an engine starting device, assigned by Chas. F. Kettering and Wm. A. Chryst to the Dayton Engineering Laboratories Co., of Dayton, Ohio. In their construction, the commutator brush is insulated from the brush holder carrying the same, but connected to this holder through a resistance which can be cut out.

Shade Holder (1,274,214).—For supporting bowls with contracted mouths, Arthur J. Tizley uses a shade holder



having arms which underhang the contracted part of the bowl. One of the arms has its end portion pivoted,

No. 1,274,214.—Shade Holder.

so that this end can be swung free of the globe. A spring-pressed sleeve normally holds the free arm portion ically catches it when moved to that position. (Patent assigned to Edward F. Caldwell & Co. of New York City).

Casting Battery Plate Straps (1,274,016.)—A machine for casting straps to groups of battery plates. Patent assigned by Ernest Disinger (of Cleveland, O.) to the Willard Storage Battery Co.

Men in Service

New York Telephone Men Take Up Signal Work Overseas —Dr. A. S. McAllister Enters Ordnance Department

G. B. TURNER, manufacturer of standardized electric signs at Ypsilanti, Mich., has enlisted in the Ordnance Department of the U. S. Army.

J. G. FISHER, superintendent of the Drumright division of the Oklahoma Gas & Electric Company, has joined the United States Army, and is now in training at Camp Pike, Ark.

GEORGE N. ROOKER, manager of the Mountain States Power Company at Sandpoint, Idaho, has been appointed chairman of the Bonner County Liberty Loan Campaign Committee for the Fourth Loan.

H. A. JOSLIN, district manager of the Oregon Power Company at Dallas, Oregon, has been appointed Farm Labor Agent by the Dallas Commercial Club, acting for the United States Labor Commission. Mr. Joslin has also been appointed vice-president of the Chamber of Commerce.

WILLIAM G. EAGER, formerly vice-president of the Valdosta Lighting Company and consulting engineer for the General Utilities & Operating Company of Baltimore, Md., has received a commission as lieutenant of the line (senior grade) United States Naval Reserve Force, and has been assigned to Philadelphia for field work.

R. L. LLOYD has severed his connection with the Philadelphia Electric Company and has entered the engineering department of the American International Shipbuilding Corporation at Hog Island, Pa. Mr. Lloyd, as commercial engineer for the Philadelphia company specialized in refrigeration and later devoted considerable attention to electric vehicles. He was chairman of the Philadelphia section, Electric Vehicle Association, for a number of years.

ILUMINATING ENGINEERING SOCIETY in the August 30 issue of Transactions records the names of the following members of the organization who have become affiliated with the active military or naval service of the United States: Leigh H. Bair, Guy S. Brandreth, S. B. Burros, Paul C. Egan, William W. Edie, Harold Goodwin, Jr., Harry I. Gross, Milton B. Hastings, Wallace B. Hurley, J. B. Juvenal, Dugald C. Jackson, Edward F. McNally, and Josephus E. Hamilton Stevenot.

LIEUTENANT G. EVERETT HILL, JR., of the 407th Telegraph Battalion, American Expeditionary Forces, after about 10 months' service in France, has been detached from his unit and assigned to duties as an instructor at Camp Alfred Vail. In passing through New York, Lieutenant Hill was warmly received by many of the officials and his former associates in the New York Telephone company, and he was much sought after and always besieged with questions whenever these visits became known.

ROLL OF HONOR.

The electrical industry, perhaps to a greater extent than any other industry, has answered the call of the Nation for Men. As this is a war of engineers, naturally the technically trained men in the electrical industry have been in great demand and they have responded with splendid patriotism. Many of the large utility and industrial corporations have assigned men for Government service aside from those who have voluntarily entered or been called for service.

THE ELECTRICAL REVIEW *will welcome news concerning men who have entered the service or who are engaged in any patriotic duties.*

N. P. BRAY, formerly an engineer for the Sapulpa Electric Company at Kiefer, Okla., was made a sergeant and placed in charge of the 75 men who left Sapulpa recently for Camp Pike, Ark.

LIEUT.-COL. P. P. WALKER, Engineers, U. S. A., is now stationed at Camp Cody and expects to leave shortly for France. In civil life he is dean of the School of Engineering, University of Kansas.

DR. A. S. MCALLISTER, past-president of the Illuminating Engineering Society, has gone to Washington, D. C., where he becomes an assistant to Major Thompson of the Progress Section of the Control Bureau of the Ordnance Department. Prior to going to Washington Dr. McAllister was active in New York engineering society committee work relative to war matters.

FREDERICK G. SIMPSON, vice-president and general manager of Kilbourne & Clark Manufacturing Company, Seattle, makers of wireless apparatus, has been called into active service and is assigned to engineering duties in the Navy, with rank of lieutenant in Naval Reserves. His wireless inventions and improvements, adopted by the Kilbourne & Clark Manufacturing Company, have brought him into prominence in connection with this branch of war work.

FIRST LIEUTENANT ROBERT MONTGOMERY of the 334th Infantry, formerly manager of the commercial department of the Louisville Gas & Electric Company, in a recent letter says: "Our division is known as the 'Singing Division.' For a year we have devoted a half hour each morning to singing. We sing by platoons, by company, by battalion, by regiment, and once in a while our whole brigade competes with another brigade. Don't you think when the Germans hear a whole brigade singing in the distance they will think hell has broken loose?"

EMPLOYEES OF THE NEW YORK TELEPHONE COMPANY.—The five companies of the Signal Corps, U. S. R., composed of employees of the New York Telephone Company, which were formed last year, are all now a part of the foreign expeditionary forces of this country. Two companies, one made up of employees of Manhattan-Bronx-Westchester Division, and the other of employees of the Long Island Division, received their military training at Camp Alfred Vail, and sailed for France last August under the command of Major H. H. Shearer. This is now known as the 407th Telegraph Battalion. One company, composed of employees of the Hudson, Central, and Western Divisions, received its military training at Camp Sherman, Chillicothe, Ohio, and sailed for France the latter part of May of this year. The battalion of which this is a part is now known as the 403rd Telegraph Battalion. It embarked from Camp Merritt, and before sailing was visited by officials from the up-state divisions and from headquarters at New York, and by many of their friends and relatives. The remaining two companies, one composed of employees of the Manhattan-Bronx-Westchester Division, and the other of employees of the New Jersey Division, received their military training at Camp Dodge, Des Moines, Iowa, and sailed the middle of July under the command of Major C. Badeau. It embarked from Camp Mills.

Obituary.

LIEUT.-COL. MORRIS N. LIEBMANN, second in command of the 105th Infantry in France, and in civil life vice-president of Foote, Pierson & Company, New York City, manufacturers of electrical testing apparatus, was killed by a rifle bullet on August 8 while leading his men in action with the British. Colonel Liebmann was a veteran of the New York National Guard, serving nearly eighteen years, and served throughout the Spanish-American war with a guard regiment from Nebraska. He entered service with the New York State organization as a private in Company I, 23rd Regiment of Brooklyn and won advancements through the various ranks. In 1916 when the 23rd Regiment went to Pharr, Texas, for border service he was appointed regimental adjutant with the rank of captain, and in April of last year was promoted to a lieutenant-colonel. In August, 1917, Colonel Liebmann went to Spartanburg, S. C., where he was transferred to succeed Lieut.-Col. Hutchinson as second ranking officer of the 105th Infantry. Colonel Liebmann was an associate member of the Illuminating Engineering Society since 1913, and his death is the first to be reported among the society's members now serving at the front with the forces of the Allies.

Personal

E. F. Newkirk Chairman of Committee on Window Displays—A. D. McMullen Resigns—T. R. Taltavall Succumbs

W. Stephens, 10 Fifth avenue, New York, has been appointed representative for Thomas A. Edison, Inc., West Orange, N. J., to represent the corporate interests.

A. W. Hartigan, 135 Broadway, New York, has become representative for the Electrical Alloy Company, New Jersey, representing the company in connection with corporate matters.

F. L. Huber, city representative of the Mohawk Electrical Supply Company, Syracuse, N. Y., assigned to the industrial plant trade, was recently appointed sales manager of the company.

R. O. Wortman, formerly manager of the Securities Department of the Northern States Power Company at Minneapolis, has been transferred to the Chicago office of the Bond Department of H. M. Byllesby & Company.

Melvin D. Anderson, of the industrial sales department of the Rochester Railway & Light Company, Rochester, N. Y., has left for Ann Arbor, Mich., where he has accepted a position at the University of Michigan as instructor of telephone electricians of the National Army.

V. A. Zehr, formerly engineer in charge of pumping stations, designs and construction with the E. T. Perkins Engineering Company, Quincy, Ill., is now superintendent in charge of construction at pumping plant in the Green Bay Levee and Drainage District, Iowa.

James D. Taylor has resigned his position of chief engineer and superintendent of the Twenty-third street branch of the Y. M. C. A. to assume the duties of chief engineer and assistant superintendent of the Metropolitan Museum of Art, New York.

William B. McKinley, Champaign, Ill., president of the Illinois Traction System and of its many affiliated electric companies, will go with a party of congressmen to visit the western battle front in Europe. Mr. McKinley is congressman from the nineteenth Illinois district.

A. D. McMullen has resigned as general manager of the Capitol Electric Company of Salt Lake City, to become president of the Motor Mercantile Company of that city. This company handles exclusively wholesale automobile accessories and supplies as well as electric supplies such as Edison Mazda lamps, motors, motor generators and Tungar rectifiers.

M. C. Gilman has resigned as sales manager of the Toronto Electric Light Company, Toronto, Ont., to become manager of Willis L. Adams' Montreal office at 501 Power building, who handle the sale of Packard transformers and meters, Thomson spot, butt and seam welders, Majestic electric heaters; a line of motors, arc welders, etc.

Thomas J. Connolly, Troy, N. Y., connected with the United Traction Company of that city, has resigned to become traffic superintendent of the Trenton & Mercer County Traction Corporation, Trenton.

Edward B. Gay, Jr., a consulting engineer of Philadelphia, Pa., has accepted the position of hull fitting engineer with the American International Shipbuilding Corporation, Hog Island, Pa.

A. F. Van Deinse, formerly connected with the Federal Light & Traction Company, New York, has become associated with the Columbus, Delaware & Marion Electric Company, Marion, Ohio, as general manager.

H. E. Jacks, formerly chief electrician for the Fort Worth Power & Light Company, Fort Worth, Tex., has severed his connection with that company to become chief electrician of power plants for the Kansas City Light & Power Company, Kansas City, Mo.

Joseph F. Putnam, of the auditing department of the Rochester Railway & Light Company, Rochester, N. Y., has been appointed administrative fuel engineer for Tompkins County by the U. S. Fuel Administration. Mr. Putnam is also teaching electrical engineering in Cornell University.

H. Wallace Morey has severed his connection with the National Association of Electrical Contractors and Dealers, as assistant to the secretary and has entered the Naval Reserve. He is located at Pelham Bay just outside of New York City and it is hoped by his former associates that his close proximity to the National Headquarters will permit of a visit now and then.

E. F. Newkirk, who is in charge of the Window Display Service of the Edison Lamp Works of the General Electric Company at Harrison, N. J., has just been appointed chairman of the Committee on Window Displays for the Mazda lamp industries. The work of this committee will be carried on in co-operation with the National War Service Committee on Window Displays, the purpose being to supply all agents and distributors of Mazda lamps with patriotic window trimming material in furtherance of the government's efforts in the various war activities. Most Mazda lamp merchants have made some effort individually along these lines, but with a chairman in charge who will co-operate with them, this work can now be carried out more effectively. The Edison Lamp Works has especially been active in boosting the Liberty Loans, War Saving Stamps, Food Conservation, and Fuel Saving, and was among the first to get a national distribution of display material for recruiting work in the early days of America's participation in the war.

L. W. Helmreich, formerly head of the electrical department of the Ranken Mechanical School of St. Louis, Mo., has become engineer of the electricity, gas, heat and water department of the Public Service Commission of Missouri, Jefferson City, Mo.

James T. Hutchings, vice-president and general manager of the Rochester Railway & Light Company, Rochester, N. Y., has been appointed a member of the State Advisory Board in U. S. Employment Service Organization and as such will assist in the Government labor distribution program which became effective on August 1. Mr. Hutchings was also made a director of the company at a recent meeting of the board of directors in place of Alfred H. Smith, who is now Regional director of Railroads under Secretary McAdoo.

Obituary.

Squire V. Mooney, president of John A. Roebling's Sons Company of California, died at San Francisco on August 29. Mr. Mooney was one of the best known men on the Pacific coast, and has been connected with the Roebling company for over a quarter of a century.

Robert C. Green, superintendent of equipment, Lehigh Valley Traction Company and the Eastern Transit Company, died at his residence, 1113 Hamilton street, Allentown, Pa., August 31, at the age of 34 years. He was at one time superintendent of equipment for the Rochester City Railway, Rochester, N. Y.

Thomas R. Taltavall, aged sixty-three years, editor of *Telegraph and Telephone Age*, New York, died at his home at Havanah, N. J., on September 2nd of heart disease, after an illness of several months. Mr. Taltavall learned telegraphy at Wellsville, Ohio, in 1867 and soon developed into one of the most expert telegraphers in the country, being employed in many of the larger offices. He was selected as one of the original operators to man the first wire leased by the Associated Press to carry the newspaper service between New York and Washington in 1875 and was assigned to the Washington, D. C., bureau. He was soon after transferred to the New York office with which he remained fourteen years, the latter eight of which he filled the position of superintendent of the leased-wire system of the Associated Press. In 1890 he resigned to become editor of the *Electrical Age*. In 1894 he became associate editor of the *Electrical World*, which position he held until 1911 when he accepted the editorship of *Telegraph and Telephone Age*. Mr. Taltavall had invented many useful electrical and other devices and was one of the best known writers of electrical literature in the country.

Financial News

Government Appropriations to Public Service Corporation.

Public Service Corporation has received the following appropriations from the Government for its electric railway and electric power systems: For extension of traction line at Newark Bay, including 18 additional cars, $821,739; for increased power facilities and extensions in traction system at Camden and Gloucester City, including 33 cars, $1,240,780; for new electrical feeders at Kearney, near Newark, $39,586; for extensions in housing development for the New York Shipbuilding Company, Yorkship Village, Gloucester City, electrical work, etc., $215,000.

General Electric Earns at $26,000,000 Rate.

As a standard investment issue, the strength of the General Electric Company is reflecting not only the remarkable prosperity of the electric companies but the recovery from the undervaluation of the stock resulting from the wave of investment liquidation which was precipitated by the entrance of the United States into the world war. On an annual dividend basis of 8 per cent cash and 4 per cent stock at par, General Electric yields about 14 per cent, and recent improvement marketwise is recognition of the fact that the issue has been selling out of line in view of its strong financial position and extraordinary volume of business. Current orders are running at the annual rate of $250,000,000, against a rate of less than $240,000,000 for the corresponding period last year. Bookings for the full year 1917 aggregated $246,778,491 and the amount by which they surpassed the rate up to this time last year bids fair to be equalled in the calendar year. In any event, it would not be surprising if the volume of sales billed in 1918 should reach the $225,000,000 mark, against $196,926,318 in 1916. The corresponding total for 1906, or 12 years ago, was $43,146,902, and for 1896, or 22 years ago, was $12,730,058.

An outstanding feature of General Electric's financial position is its great strength of working capital. Cash on hand at the close of 1917 was $21,190,675, as against $12,167,707 at close of 1916. Total quick assets as of December 31, last, were $154,549,251. Current liabilities aggregated $20,907,746, leaving working capital of $133,641,505, or $131.6 per share, as compared with $83,179,120, or $81.9 a share, at the end of 1916.

The percentage cost of sales of 85.2 per cent in 1917 was the lowest in many years. The percentage cost of sales in the last five years, including depreciation charges, which, in the case of General Electric are always large, has been about stationary and the average for the period is 88.7 per cent. This profit of 11.3 cents on the dollar compares with 14.1 cents in 1916 and 7.9 cents in 1896.

Manufacturing and labor costs being higher, it is probable General Electric this year will report a smaller percentage of net. As compared with 85.2 per cent in 1917, ratio of manufacturing costs and interest charges to sales billed will probably be not less than 88 per cent this year. Applying this percentage to the estimated total of $225,000,000 sales billed would give $27,000,000 net, to which must be added "other income" last year amounting to $4,512,290, or $31,512,290 in all.

The General Electric Company has subordinated regular business to the Government's needs. A substantial part of its present production consists of turbines for merchant ships and war vessels. The company has a blanket order from the Government to turn out as many turbines and as much electrical equipment as its facilities will permit, so that with ordinary business accumulating, capacity operations at all plants are assured indefinitely.

Puget Sound Utility Issues Notes.

The Puget Sound Traction, Light & Power Company is offering an issue of short term notes, maturing June 1, 1921, and are capable of yielding 7¾ per cent. The issue is secured by a first mortgage on a substantial part of the property and by a general mortgage, either directly or through the deposit of securities. There are outstanding $12,250,000 of the authorized issue of $20,000,000. A sinking fund is to be established calling for an annual reserve (April 1, 1919, and 1920) equal to 1½ per cent of the entire bonded indebtedness, to be used to purchase the 7 per cent notes in the open market. The Puget Sound Traction, Light & Power Company operates in the Puget Sound district which includes the cities of Seattle, Tacoma, Bellington and Everett, Wash., handling substantially all the electric lighting and power business. The population served exceeds 500,000. Over 75 per cent of the total generating capacity of the system's plants in hydro-electric. Net earnings for the year ended April 20, 1918, were officially reported as $3,866,030, or twice interest charges on the funded debt of the company. The company is now handling the largest gross business in its history and is in a position to make a splendid showing with net earnings for the current year showing a considerable increase.

Income Account of Great Western Power Shows Increase.

The comparative income account of the Great Western Power System, intercompany business eliminated, shows for July gross earnings of $409,300, an increase of 27.6 per cent over July, 1917. The net earnings of the system for the month aggregate $248,783, an increase of 19.8 per cent over the corresponding period last year. For the twelve months ended July 31, gross earnings were $4,201,748, an increase over the corresponding twelve months period of 7.5 per cent; net earnings, $2,568,669, an increase of 3.4 per cent. The increases were due largely to a substantial advance in the company's rate schedule recently authorized by the California Railroad Commission, which became effective July 10.

MISSISSIPPI RIVER POWER COM.

	1918.
For July—	
Gross earnings	$ 191,147
Net earnings	151,586
Surplus after charges	31,053
12 months ended July 31—	
Gross earnings	2,137,303
Net earnings	1,719,742
Surplus after charges	267,580

KEOKUK ELECTRIC COMPANY.

	1918.
For July—	
Gross earnings	$ 22,086
Net earnings	5,499
Surplus after charges	2,783
12 months ended July 31—	
Gross earnings	258,240
Net earnings	65,762
Surplus after charges	35,046

SIXTY-ONE PHONE COMPANIES.

The statement for sixty-one telephone companies issued by the interstate commerce commission for April shows:

	1918.	1917.
Operating revenue.	$ 28,043,352	$ 25,353,819
Operating income.	7,036,056	6,825,265
From January 1—		
Operating revenue.	110,114,958	102,696,758
Operating income.	26,338,401	27,571,180

GREAT WESTERN POWER SYSTEM.

For July—	
Gross earnings	$ 409,299
Operating expenses and taxes	160,516
Net earnings	248,783
12 months ended July 31—	
Gross earnings	4,201,748
Operating expenses and taxes	1,623,079
Net earnings	2,568,669
Net income	893,980
Balance	743,980

WEEKLY COMPARISONS OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities—	Div. rate. Per cent.	Bid Sept. 3.	Bid Sept. 10.
Adirondack Electric Power of Glens Falls, common	6	13	13
Adirondack Electric Power of Glens Falls, preferred	6	68	68
American Gas & Electric of New York, common	10+extra	81	81
American Gas & Electric of New York, preferred	6	37	37
American Light & Traction of New York, common	..	182	182
American Light & Traction of New York, preferred	6	91	91
American Power & Light of New York, common	4	40	40
American Power & Light of New York, preferred	6	66	66
American Public Utilities of Grand Rapids, common	..	..	..
American Public Utilities of Grand Rapids, preferred	6	..	..
American Telephone & Telegraph of New York	..	98	97½
American Water Works & Elec. of New York, common	..	4¾	4
American Water Works & Elec. of New York, particip	7	12	12
American Water Works & Elec. of New York, first preferred	..	57	58
Appalachian Power, common	..	3	3
Appalachian Power, preferred	7	21	21
Cities Service of New York, common	+extra	208	209
Cities Service of New York, preferred	6	72	72
Commonwealth Edison of Chicago	8	101	101½
Comm. Power, Railway & Light of Jackson, common	..	20	20
Comm. Power, Railway & Light of Jackson, preferred	6	40	38
Federal Light & Traction of New York, common	..	7	7
Federal Light & Traction of New York, preferred	..	35	35
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	15	15
Middle West Utilities of Chicago, preferred	6	35	35
Northern States Power of Chicago, common	..	43	44
Northern States Power of Chicago, preferred	ex.div.7	81	80
Pacific Gas & Electric of San Francisco, common	..	34	34
Pacific Gas & Electric of San Francisco, preferred	6	79¼	78
Public Service of Northern Illinois, Chicago, common	7	75	75
Public Service of Northern Illinois, Chicago, preferred	6	82	82
Republic Railway & Light of Youngstown, common	4	19	19
Republic Railway & Light of Youngstown, preferred	6	57	57
Standard Gas & Electric of Chicago, common	..	4½	4½
Standard Gas & Electric of Chicago, preferred	6	21	22
Tennessee Railway, Light & Power of Chattanooga, common	..	2	2
Tennessee Railway, Light & Power of Chattanooga, preferred	6	12	12
United Light & Railways of Grand Rapids, common	4	28	30
United Light & Railways of Grand Rapids, preferred	6	60	60
Western Power of San Francisco, common	..	12	12
Western Power of San Francisco, preferred	6	48	48
Western Union Telegraph of New York	extra	84	83½
Industrials—			
Electric Storage of Philadelphia, common	4	52	52
General Electric of Schenectady	8	147	145
Westinghouse Electric & Mfg. of Pittsburgh, common	7	44¾	42¼
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	61	58

*Last sale.